McGRAW-HILL DIGEST

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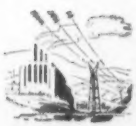

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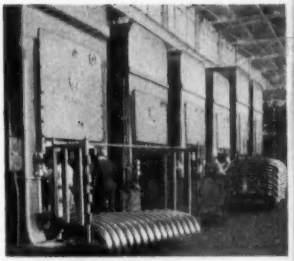

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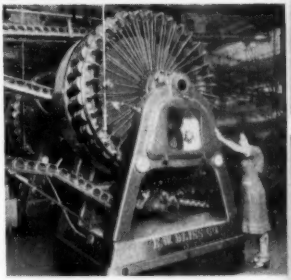

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World News Offices: London, Paris, Berlin, Moscow, Tokyo, Melbourne, Bombay, Buenos Aires, Rio de Janeiro, Stockholm, Mexico City

VOLUME 3 • NUMBER 1
JANUARY, 1948

JOHN F. CHAPMAN
Publisher

F. K. LAWLER, *Editor*

J. H. McKEE, Jr.
Assistant Editor

SHELBY McMILLION
Business Manager

FREDERIC C. THIEME
Advertising Manager

McGraw-Hill Digest is published monthly by McGraw-Hill International Corp. for circulation in all countries except the United States and Canada. Publication and executive offices, 330 W. 42nd St., New York 18, N. Y., U.S.A. James H. McGraw, Jr., President; John Abbink, Chairman of the Board; J. L. Gilbert, Senior Vice-President; J. F. Chapman, Vice-President; George Quisenberry, Vice-President; Paul West, Vice-President; Curtis W. McGraw, Treasurer; J. A. Gerardi, Secretary; J. C. Stark, Assistant to President; K. P. Bliss, Vice-President and Director of Advertising; J. E. Blackburn, Director of Circulation. *Subscriptions may be ordered through Director of Circulation, through local book dealer, or McGraw-Hill's London Office, Aldwych House, London, W. C.* 2. Subscription rates: $5 for 1 year, $8 for 2 years, or $10 for 3 years; single copy, 50¢ (U. S. currency or equivalent). Application for entry as second-class matter in New York, N. Y., is pending under the act of March 3, 1879.

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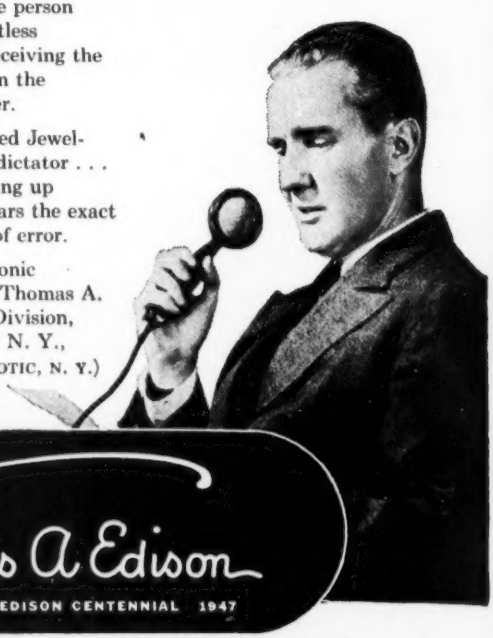

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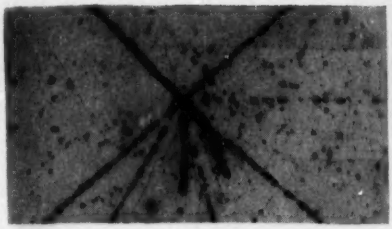
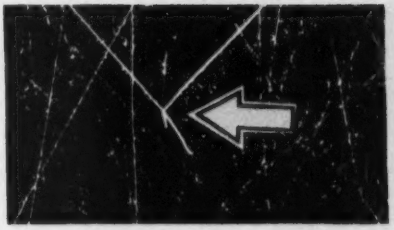


DISINTEGRATION of cosmic rays recorded on this plate. Rays may come from sun.



ARROW indicates atomic destruction photographed with aid of Wilson cloud chamber.

Scientific Highlights of 1947

Scientists look at developments of year and select the 15 most outstanding. Some made news headlines, others missed public recognition

Many of the 15 most outstanding scientific developments of 1947, as selected by a panel of the American Association for the Advancement of Science, were not headline news during the past year. But they were stepping stones to man's understanding of life and disease. Scientists feel that '47 discoveries point to an even more important scientific year to come. Briefly the highlights were:

Chemistry—Element 61 — Illinium — was seen for the first time this year with help from the ion-exchange column. In the column, electrically charged atoms of each element stick to powder and are rinsed off by an acid-solution rinse.

Four lost elements, having dissipated themselves through radioactivity, were recaptured by neutron bombardment of uranium 238. These are: neptunium, plutonium, americium, and urium, elements 93 to 96.

Aviation—A pilotless Douglas *Skymaster* flew the Atlantic from Newfoundland to England and back. The electronic brain did the crew's work after the plane was pointed in the direction of its destination. (See page 32.)

Anthropology—Probably the earliest inhabitant of the Western Hemisphere, the Tepexpan Man, who lived 10,000 to 15,000 years ago, was discovered in Tepexpan, Mexico. Believed to have lived during the end of the last ice age, his resemblance to current inhabitants of the area is great.

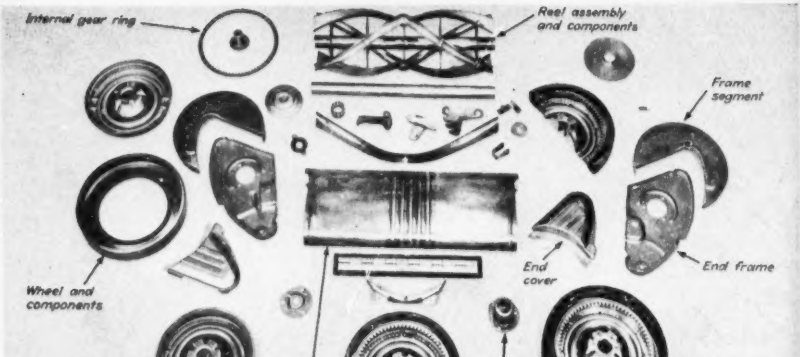
Medicine—Cancer cells were produced in drosophilla by spraying them with nitrogen mustard gas, known to cause cancer. All flies produced offspring with mutations. Four other cancer-causing gases were tried, all causing mutations in offspring.

Both meningitis and miliary forms of tuberculosis have been checked during the year by streptomycin. Previously the diseases had been fatal in a short time.

Using byproducts of the atomic pile and a Geiger counter, scientists traced iodine through rats and found that iodine is transformed into diiodotyrosine and then converted to thyroxin. If the anterior pituitary gland fails to function, rats became fat, lazy, and dull.

Nucleonics—The 184-in., 4,000-ton cyclotron at the University of California blasted the atomic nucleus into 30 or more particles, ten times more than prewar. Scientists are planning a machine they hope will change energy into matter.

Astronomy—Cosmic rays, which bombard our bodies at the rate of 20 rays per second, are believed to originate from the sun, since periods of great sun-spot



SHEET METAL MOWER—Steel stampings are used for majority of components of lawn mower developed by Associated Manufacturers, Inc. Reel consists of a welded assembly of a tubular shaft, spiders, and blades. Blades are stamped from SAE 1035 hot-rolled steel sheet 0.1 in. thick and hardened after assembly. End covers, end frames, frame segment, and top panel are ribbed and drawn to shapes that give rigid members. End covers are of 0.03-in. hot-rolled steel; end frames, frame segments, and top panel, 0.06-in. hot-rolled stock. All wheel components are 0.05.-in. hot-rolled steel. Gear laminations are clinched to holder by a press. Oil-impregnated bronze bearings support wheels, reel, and rollers. Handle is welded assembly of bent tubing. Herringbone shape of reel allows two blades to contact cutter at same time and permits high grass to be cut. A notched wheel adjusts reel-blade clearance without tools.—Prod Eng, N, 1947

activity coincide with great cosmic ray bombardment of the earth. Stars may also supply the earth with some cosmic rays.

Nutrition—The first man-made proteins were developed from amino acid and water. A chain of 10,000 molecules was produced, the nearest man has come to creating proteins.

Meteorology—Dry ice pellets dropped from planes into super-saturated clouds caused man-made rain and snow to fall in seven countries and 12 states in the United States.

Genetics—Genes, previously unseen, prove to resemble a phonographic record when seen through an electron microscope. Unbroken lines are the chromosomes, grooves are the genes.

Biology—Dead bacteriophage particles, killed by ultraviolet light, were injected into a living host and later reproduced, the offspring killing the host.

Temperature Measurement—A version of the wartime snooperscope has permitted scientists to raise their estimate of the sun's temperature from 4800° F. to 1,000,000° F. A thousand times more sensitive than previous heat recorders, a photocell translates light energy into electric energy and records the energy on a graph.—Science Ill, Ja, 24

Effects of Marshall Plan

What the Marshall Plan means to world business is discussed in an analytical 8-page report starting on page 51. Because of the plan's great significance, we call the report to the particular attention of our readers.—*The Editors*

Cheap Steel Building Frame

Frame for 50x64-ft. 3-story office building erected in 1,440 man-hours at cost under $11,500 by use of prewelded stud panels

By preassembling open-web steel studs into wall panels 10 ft. long, then welding sections together to make a light-load structural steel framework, Matthews Construction Co. erected a 50 x 64-ft., 3-story windowless office building frame in only 1,440 man hours, and at a cost less than $11,500.

Key to the fast and economical construction was the preassembly of wall panels. Studs were Bethlehem 4- and 6-in. open-web expanded steel sections delivered in long lengths. These were cut to ceiling heights on the job by friction saw on table with stops to give exact length and square ends.

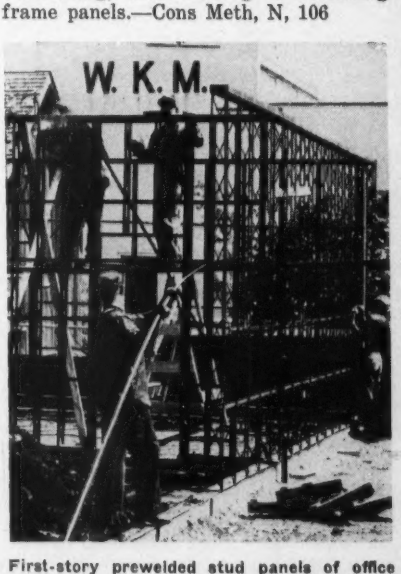
The Bethlehem studs are lightweight, lattice-web, one-piece members, made from special rolled sections by a hot-slitting, rolling, and expanding process. When braced laterally, they support a safe load of at least 6,000 lb. With the studs as vertical supports, and a girt of lightweight steel channel at upper floor levels for lateral tie-around, and steel joists as floor members, the building has a fabricated all-steel frame.

The studs were assembled on 20-in. centers into 10-ft. panels in two simple trunnion jigs that flopped over to permit all-downhand welding. In the jigs, the studs of the first-floor panels were welded to a sill plate and to a channel cap or girt; for upper floors, sill was omitted. In addition, openings were framed into the panels, and some horizontal bracing angles were welded.

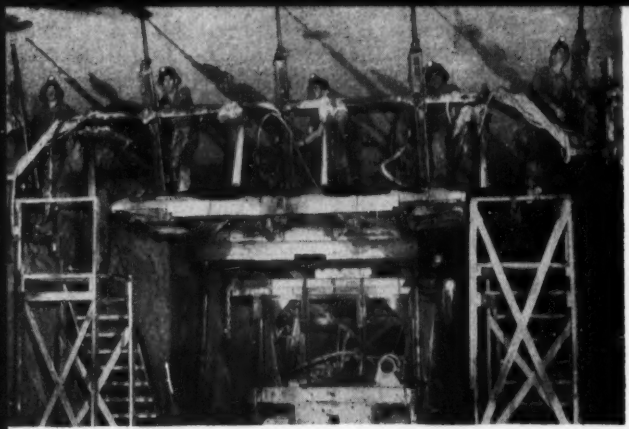
Complete panels were handled easily by two men, and required no scaffolding or special erection equipment. The first-floor sill plates were slipped over anchor bolts, and the panels were left unbraced after the nuts were drawn down. When several panels had been erected, diagonal and horizontal bracing and joints in sills and girts were welded.

Erection of upper-floor panels was similar and followed the welding of bar joists in place for ceiling of floor below. Since these upper wall frames were without sill plates, they were held vertical while the bottoms of the studs were welded to girt channels of panels below.

The building frame was put up at a cost of less than $0.11 per cu. ft., or about $1.19 per sq. ft. of floor area. This figure includes placing and welding of bar joists, fire escapes, staircase, and steel roof decking, as well as furnishing, fabricating, and erecting the building frame panels.—Cons Meth, N, 106



First-story prewelded stud panels of office building frame are held by foundation bolts. Workman is inserting one of four angles placed in each 10-ft. wall height for additional bracing.



FIVE - MACHINE tractor-mounted jumbo speeds blasting of rock in large flat open stopes. Mobile unit is designed to permit proper spacing of drill holes so that fragmentation will not be excessive. Drifters are equipped with power feed. Another crawler-mounted jumbo has three drifters mounted on wagon-drill sashes and moved by chains, sprockets, and air motors. Two men operate three machines.

Progress in Mining, Milling,

Review of new equipment and improved practices which are improving efficiency, safety, and working conditions in mineral industries

Color photography of drill cores provides for easy storage and quick, convenient examination of drill records without sacrificing any important physical characteristics of the cores.

Success of belt conveyors in open pit mining is resulting in underground installations. At Sherwood mine, 818-ft. and 648-ft. conveyors, each taking 20 hp., handle 200 tons an hour. Sullivan Mine's 2,496-ft. conveyor system hoists as well as conveys; it saved sinking a shaft.

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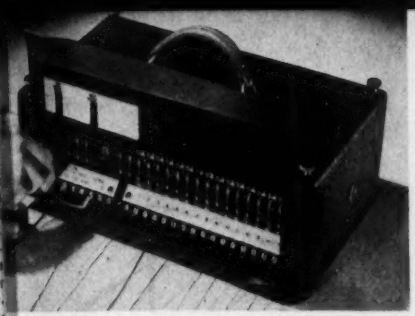

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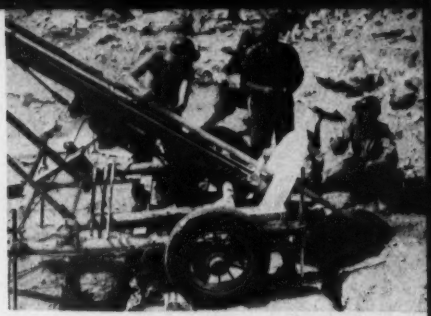

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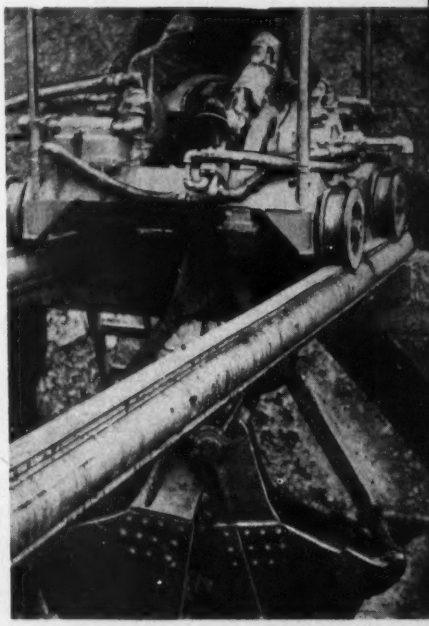
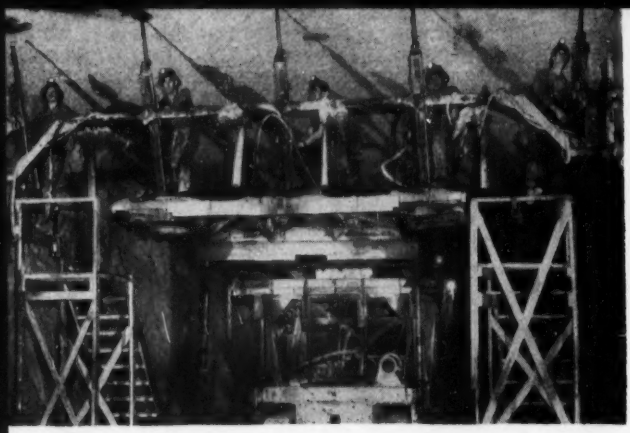


SHAFT SINKING is facilitated by the redesigned Riddell clamshell shaft mucker, operated by one man. Hand and foot levers control air-powered hoist and carriage. Carriage and track are lowered to new timber sets as shaft sinking advances. Record shaft sinking rate is 152 ft. a month.



FIVE - MACHINE tractor-mounted jumbo speeds blasting of rock in large flat open stopes. Mobile unit is designed to permit proper spacing of drill holes so that fragmentation will not be excessive. Drifters are equipped with power feed. Another crawler-mounted jumbo has three drifters mounted on wagon-drill sashes and moved by chains, sprockets, and air motors. Two men operate three machines.

Progress in Mining, Milling, ar

Review of new equipment and improved practices which are improving efficiency, safety, and working conditions in mineral industries

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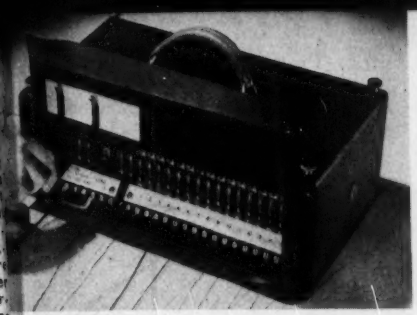

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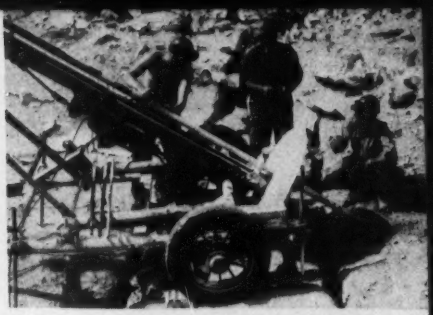

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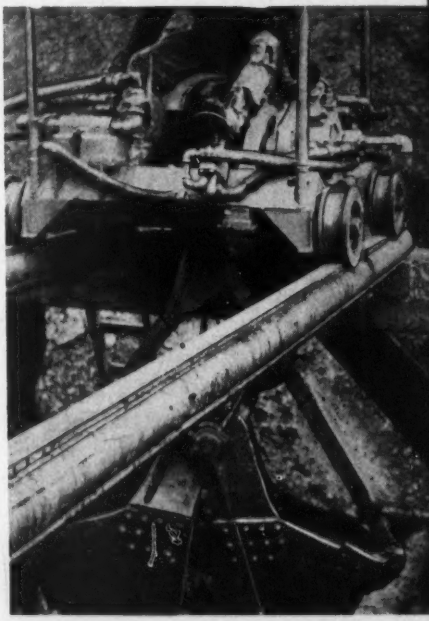

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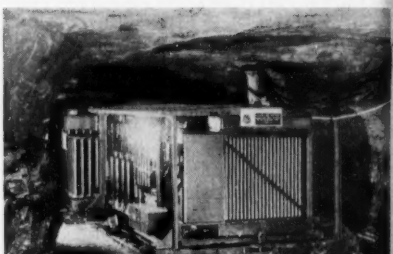
EASILY OPERATED electrical controls have replaced back-breaking levers on big placer dredges, enabling winchman to do a better job.



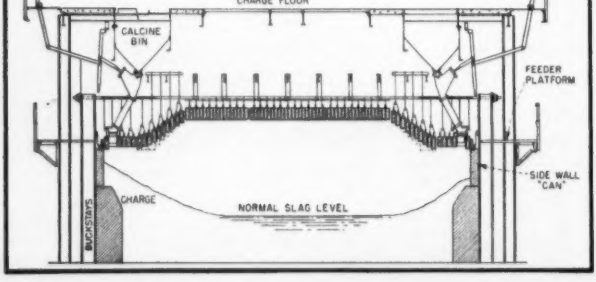
PORTABLE dc. substation is ideal for expanding mining operations. This unit includes an ignitron type rectifier, heat exchanger, liquid-filled transformer, and switchgear.

applicable to other minerals, and to separations perhaps as fine as 200 mesh. As a thickener, the cyclone has enormous capacity, but it does not produce a clear overflow. The cyclone operates by reason of the rotation within it of pulp injected at pressures up to 25 lb. or so. Heavy minerals, or thickened pulp, come out at the bottom; light minerals rise out through the discharge pipe. For concentration, a medium like magnetite must be used; for thickening no medium is needed. Providing large capacity in small space, a 6-in. cyclone can wash 10 tons of coal, or thicken 50 tons of pulp, per hr.

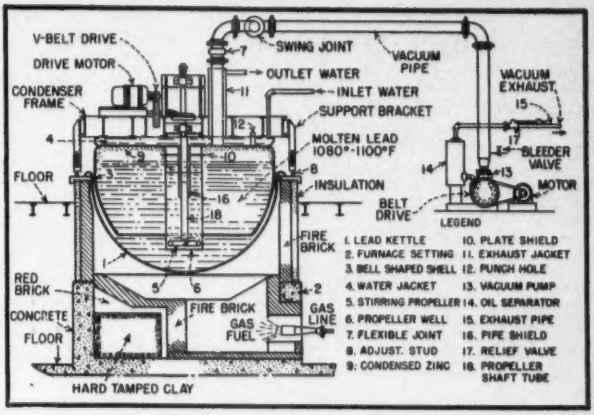
Significant improvements in many operations such as roasting arsenopyrite concentrates and the calcination of limestone and lime sludges are promised by the Dorrco FluoSolids process, just revealed.

It utilizes the fundamental principle of carrying out a gas-solid reaction in a dense suspension of the solids, maintained in a turbulent mass by the upward flow of the gases that effect the reaction. The mass assumes a fluid level and acts as a fluid.

Oxygenation of roaster, furnace, converter, or fuming plant air promises to



DOWN TIME for roof and wall repairs has been eliminated by the suspended-arch reverberatory furnace used in Canada. This type of furnace also has permitted widening and changing contours without shutdowns. Newer features are use of beveled brick in sloping faces and hanging only alternate pairs of brick in cans.



VACUUM DEZINCING of lead, developed by St. Joseph Lead Co., has proved thoroughly practicable. The molten lead is placed in a large kettle, covered and subjected to vacuum, zinc condensing on the inside of the cover. Vacuum also is an important feature of the Pidgeon process for producing magnesium by reduction with ferrosilicon.

help the smelter and acid producer. Made practicable by cheap oxygen and pioneered in the steel industry, the technique is being practiced at one fuming plant and will be tried in lead blast furnacing.

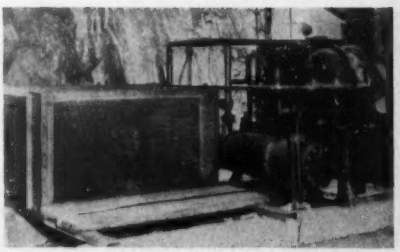
Continuous electrothermic reduction of zinc is likely to receive greater attention. It lends itself to close control of furnace atmospheres. This type of furnace also is being applied to continuous fuming of lead slag. Electric smelting of copper, as done in Finland, lends itself to competitive production costs where electric power is cheap, to richer gases for acid making, to long furnace life, and to close control of furnace conditions.

Continuous refining of lead, practiced in South Australia, has certain advantages. Lead bullion may be softened continuously, and in the process antimony, arsenic, and tin may be removed by drossing. These sources of lost time are eliminated: filling batch furnace, heating furnace, cooling again to skimming temperature, skimming, and emptying the furnace.

Ordinary melting practices may be outmoded by continuous electric melting, as in the production of oxygen-free copper in the 2,250-kw., 7½-tons-per-hr. furnace at Carteret.

Soda treatment of lead drosses, developed by American Smelting and Refining Co., has proved a consistent, simple method of producing high-copper, low-lead speisses and mattes under various conditions.

To reduce handling costs and theft losses, in shipments between smelters and refineries, American Smelting & Refining Co. developed the 10-ton ingot.—Eng & Min J, N, 91 (*This review supplements that published in the May, 1947, issue of the McGraw-Hill Digest*—THE EDITOR.)



SPOT COOLERS have proved effective in dehumidifying and cooling the air in hot underground working areas. These relatively low-cost units can be placed where needed.

MAKES RICE-LIKE CEREAL FROM HYDROLYZED WHEAT

Rycena, a new hydrolyzed wheat cereal that can be cooked and eaten like rice, is being produced in Australia for export to the Orient. Demand has exceeded capacity although Rycena Food Products, Melbourne, and 10 mills in the Commonwealth are producing it.

Wheat, preferably of low gluten content, is hydrolyzed at 180°F., destroying the active physical properties of the gluten in the endosperm. This operation also enhances the palatability, but does not impair the food value. In a subsequent mechanical operation, the hydrolyzed wheat is stripped of part of the bran layers. Simultaneously, both ends of the grain are removed to open the plant juice channels and remove the germ. The mill consists of an outer casing, lined with milling wire, and an emery roller inside the casing.—Food Ind, N, 71

ICED CONCRETE FOR DAM

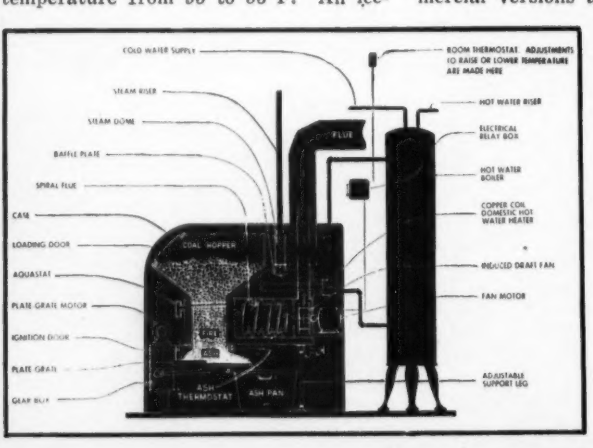
Ice cubes are being used to cool concrete prior to pouring at the Fort Gibson, Okla., dam. In tests, 16½ lb. of ice to each cu. yd. of concrete lowered concrete temperature from 95 to 53°F. An ice-making plant has been erected at the site. Ice is formed in 300 two-inch tubes, gaseous ammonia being circulated around pipes. Cutting knife cuts cylinders of ice into ½-in. lengths.—Business Wk, O 25, 56

NEW HARD COAL HEATER INCREASES HEAT OUTPUT

To meet competition of oil-burners, Anthracite Industries, Inc., has developed a new coal burner-boiler, said to be 15 to 38% more efficient than existing units. It will burn pea-sized anthracite—about $2 per ton cheaper than usual sizes of hard coal used. Called the "Anthratube", the unit delivers 80% of the coal's heat value, compared with 50–65% for standard units.

Coal is fed into a steel tube about 18 in. long, being burned in the center of the tube and discharged as ash at the lower end. Forced feed pushes coal through the tube slowly, induced draft keeping the coal burning. Water jacket surrounding the tube picks up heat generated. Unit is almost smoke and soot free.

Two models have been developed—a hot-water and a steam-boiler model. A hot-air model is under development. Commercial versions are either bin-type or hopper-type. Bin-type feeds directly from bin to unit by rotating pipe. A 24 x 31 x 42 in. unit will heat a 6- or 8-room house. Hopper of hopper-fed type, 27 x 47 x 37 in., holds 250 lb. of coal, one hopper full heating a 5- to 8-room house for three days during severe weather.— Business Wk, N 1, 56



Operating parts of the hopper-type Anthratube.

WELDS CAR ROOF—Roofs for railroad passenger cars are seam welded by machine and jig at Pullman-Standard. Roller electrodes are mounted on a carriage traversing width of roof on a curved track. Two electrode wheels weld seams simultaneously on each of two sheets which butt together. A 40-electrode multiple-spot welder that indexes automatically fastens stiffeners to car side sheets.—Weld Eng, N, 36

WHAT ATOMIC BOMB DID TO ELECTRIC SYSTEM

When the atom bomb was dropped at Hiroshima, radioactive substances did no damage to the electric utility system of Chugoku Electric Supply Co. Nor did the blast damage underground cable systems, except at terminals.

Bulk of the damage to wood-pole distribution lines was caused by fire, usually spread from adjacent inflammable buildings. Latticework steel poles were particularly vulnerable to damage at distances up to 6,000 ft. from the bomb center. Reinforced concrete poles survived the blast best of all.

The smaller distribution conductors were cut, broken, or burned up to 1½ miles from the blast. Only 10% of the line insulators were damaged, and there was no damage by bomb force beyond a mile.

Damage to pole-top transformers was extensive within a mile from the blast, principally because of fire and jarring from poles. Fire caused the major damage to plants and substations, which had wooden roofs in many cases. Brick and reinforced concrete plant structures a mile or more from the blast stood up well, although the interior usually was burned out because of wooden roof construction. A brick substation 500 ft. from the bomb center was demolished.

In a city of modern construction, the electric supply system would be damaged far less than it was at Hiroshima.—Elec World, N 8, 98

REDUCES WEAR ON WOOL DABBING BRUSH

Excessive wear on dabbing brushes of Noble combs has been reduced by a modification of comb construction at the University of Leeds, England. Wool is inserted into the pins in two stages—first into large circle, then into small circle, eliminating the necessity of simultaneous dabbing. Wool is entered into large circle by tapered bristles on the leading edge of dabbing brush, placing less strain on the bristles.

The fringe of uncombed fibers protruding from the inside row of pins intermesh with the small-circle pins because small circle is set at an angle so that pins of the two circles cross each other.

Points of pins in small circle must be below those of the large circle at the arc of contact. For fine wool, small circle is set at an 11-deg. angle. A small cover plate placed over the pins where wool enters pins prevents fringe from touching pins too soon.—Textile World, N, 119

Good Industrial Wiring

Electrical distribution facilities in world's largest clothing factory incorporate advanced techniques for greater efficiency

Modern electrical construction techniques are exemplified at Bond's style Manor, world's greatest clothing factory, now nearing completion. In line with modern industrial practice, power is distributed at primary voltage (11,400 volts) to strategically located unit substations. Network arrangements insure against shutdown from local power equipment failure, and there are facilities for quick rerouting of primary feeders in event of cable failures. Secondary distribution is planned for wide flexibility and ready adaptability to new department layouts.

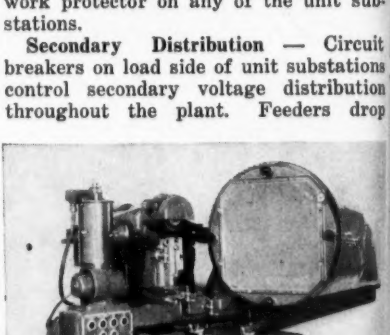
Primary Distribution—Two feeders bring the primary 3-phase power to the main switchboard, part of which is the property of the utility company and serves as a substation. Owner's section of board consists of three feeder panels and associated apparatus. Instrument array on each panel indicates volts, watts, and vars (reactive volt amperes), a relatively new arrangement considered more directly useful in operation than volts, amperes, and power factor.

Circuit breaker operating current at 125 volts is provided by a 60-cell storage battery held at full charge by a Rectox, static type, wall-mounted, 1-amp. battery charger.

Primary feeders are extended to substations at load centers. Cables are paper and lead 15,000-volt, 3-conductor, 350-MCM. Two circuits are run in underground fiber conduits to the main building substations. Cables are fireproofed in the three manholes by asbestos tape dipped in water glass. All substations are provided with transfer switches and spare primary conduits. Substations are totally enclosed, metal clad, free-standing, unit assemblies. They have 3-phase gang-operated interlocked primary selector switches, dry type transformers, air-blast cooling, and network protector or secondary main breaker.

An annunciator in the maintenance department indicates excessive transformer temperature or overload operations of the main circuit breaker or network protector on any of the unit substations.

Secondary Distribution — Circuit breakers on load side of unit substations control secondary voltage distribution throughout the plant. Feeders drop



ENLARGED-IMAGE GRINDER—For extremely accurate grinding of small profile shapes, the new Projecto-Form machine provides an optically enlarged (20:1 or 40:1) image of the work which can be compared with a previously prepared enlarged master scale drawing. Vertical, longitudinal, and transverse slides position work in relation to optical system. Transverse and vertical slides adjust grinding wheelhead in relation to work, and another slide provides longitudinal reciprocation of wheel parallel to optical axis of projection system. Cincinnati Milling Machine Co. developed the grinder.—Am Mach, O 9, 161

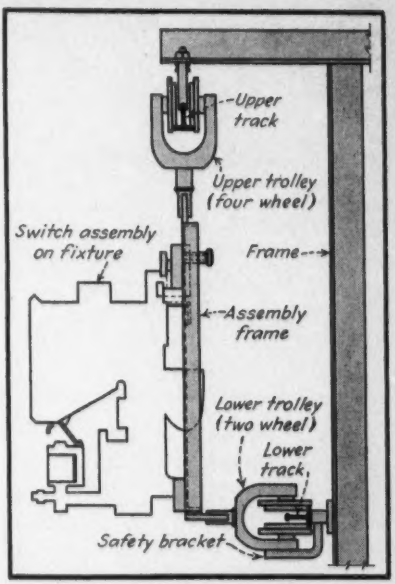
through conduit inserts in the floor to a pull box below each substation. Feeder runs are in exposed conduit. Panelboard locations usually are on centrally located columns or partitions.

Motors on second floor are fed through a network of 4 x 4-in. sheet-steel wireways with 1½-in. home runs to power panels, and with hinged covers and locking screws. Power circuits are extended to motor locations from floor sleeves in conduit.

In maintenance shops, power distribution is by enclosed busbar feeders and plug-in devices.

Secondary switchgear is self-supporting, fully enclosed, manually operated, draw out air circuit breakers rated at 600 volts, 3 phase. Disconnecting mechanisms automatically trip the breaker if an attempt is made to move it in or out of the connected position. Indicator lights show whether breakers are open or closed.

Cutting Room—For precise work, there are two rows of 40-watt fluorescent lamps extending the full length of each cutting table. Power for the cutters is supplied by a power rail between the rows of lamps. Short power cords are connected to trolleys running freely on the power rail. Lights and rail, in a special fixture, are just above head height over the center line of the cutting table.—Elec C & M, N, 43



UNUSUAL CONVEYOR—Assembly, inspection, and electrical testing of pneumatic switches are speeded by an unusual conveyor at Allis-Chalmers Mfg. Co. The conveyor has two monorail tracks. One is overhead to support switch assembly fixtures, and one is mounted sidewise to steady the bottom of fixtures. Both tracks have insulating openings on either side of electrical test station. Upper track is 66 in. above floor for convenient working height. Each assembly fixture has two adjustable laminated plastic support bars for mounting two sizes of switches, these providing additional electrical insulation. By prepositioning material in trays at each station, handling and worker fatigue are reduced. Better working conditions have improved harmony among workers.—Am Mach, N 6, 106

PREFAB ALUMINUM PARTS FOR TRUCK BODIES

More than 10,000 different aluminum van-type body combinations can be assembled by local body builders from standard parts mass produced by Reynolds Metals Co. All sections are made in a variety of sizes. Sides and ends are connected with the roof and the floor sills by aluminum corner castings and aluminum rolled sections. The flat skin of the roof and sides is riveted to channel sections to provide a rigid, sturdy construction.

To meet every conceivable operating condition, 15 rear door and two side door opening choices are provided. A ventilator detail and seven different types of interior trim are available, including a refrigerator lining.

The bodies are lightweight and corrosion resistant.—Food Ind, N, 102

DYNAMITE REPLACES CROWBAR—Dynamite has replaced the crowbar in wrecking 100x20-ft. barracks. After doors and windows are removed and end studs knocked out, five charges of four sticks each are placed under ridge of roof and fired. Explosion loosens tongue-and-groove boards and nails, permitting salvage of most of the lumber, insulation, and other materials. Wrecking of 368 buildings costs $14 per building compared to $64 by standard methods.—Eng News-Rec, N 6, 2

WHAT'S AHEAD IN AUTO BODY STYLES

"Pontoon-sided" automobile bodies, as exemplified by Kaiser-Frazer, Studebaker, Packard, and Hudson, will be the style for several years, according to speakers at the convention of American Society of Body Engineers. To prevent damage by neighboring car doors in parking lot, heavy chrome molding was suggested.

Curved windshields, in one or two pieces, and shorter and wider hoods are seen in future. New hoods probably will have valleys between center section and fender section to break flatness and give driver better road vision near car.

Passengers will sit between wheels, so both front and rear seats can be full width of car. Either front or rear engine mounting will be permissible in these designs. New air cushions of U. S. Rubber can be inflated to pressure most comfortable for passenger. Cushions designed by L. A. Young Spring & Wire Co. will take auxiliary springs so driver's cushion may be made stiffer. A new floor mat will be made in colors by U. S. Rubber and with a surface texture that looks like nap on a carpet.

The new Tinnerman quick-fastening method for gasoline tanks saves 24c per car; many kinds of quick fasteners are available.

Body builders are giving much attention to rapid labor-saving methods of making body drafts by photographic processes, developed for aircraft production.—Am Mach, N 20, 130

DOUGLAS DEVELOPS NEW SUPERSONIC PLANE

Douglas Aircraft Co.'s new supersonic research plane, the D-558-2 *Skyrocket*, incorporates improvements in sonic speed design recently learned in wind tunnel research. Stubby, low-aspect wings, of 75S aluminum alloy stressed to a design load factor of 18, are swept back 33 deg.; cathedral is 5 deg. Stall-control vanes, small "air dams" on either side of the fuselage, prevent span-wise flow. Horizontal stabilizer is swept back 40 deg., remaining unstalled when undergoing shock stall.

Power is provided by a Westinghouse 24C axial-flow turbojet, developing 3,000 lb. thrust, housed in fuselage belly. Two flush-type air intakes are used. A Reaction Motors 4-barrel rocket engine in tail develops 6,000 lb. thrust. Fuselage is cast magnesium alloy.—Aviation W N 17, 12

EIGHT-POINT PROGRAM REDUCES DERMATITIS

Industrial dermatitis has been reduced 73.8% at the West Allis works of Allis-Chalmers Mfg. Co. This has saved over $18,000 in two years in medical and compensation costs alone. Improved employee relations and saving in lost man-hours are other gains. Procedures which achieved these results include:

1. Personal hygiene program, brought to workers through foremen, also written instructions on how to wash correctly.

2. Blue shop towels for wiping parts and machinery, white towels for hands and face.

3. Foremen encouraged employees to change to clean work clothes frequently.

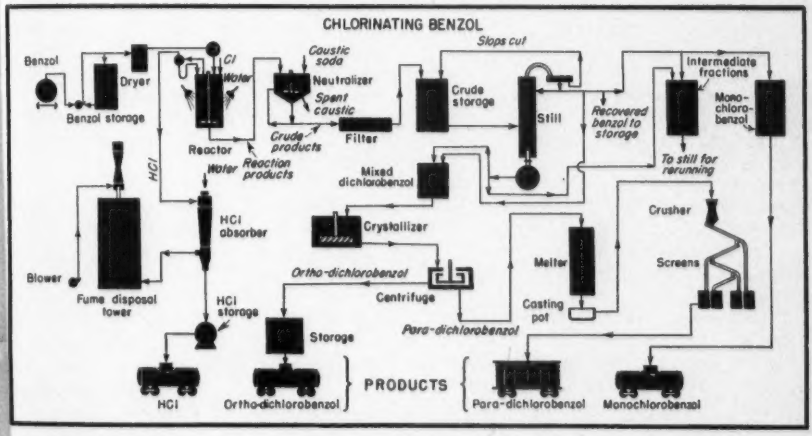
4. Jobs that require protective creams were surveyed and specifications for use of the creams established. Promiscuous use of creams was eliminated, as workers are apt to assume that these alone will prevent dermatitis.

5. Use of disinfectants in the machines was discontinued. Now oil is drained periodically and machine flushed with washing solution.

6. A pint of No. 10 viscosity lubricating oil was added to each gallon of kerosene or similar solvent to curtail defatting action resulting from exposure of skin to solvents.

7. Where there was exposure to naphtha, 5 oz. of lanolin per gal. was added.

8. Guards were provided in some instances to protect workers from oil splashes.—Am Mach, N 20, 106



CHLORINATING BENZOL—Key raw materials in organic synthesis, chlorinated benzols are in sharply rising demand as aromatic intermediates, solvents, insecticides, fumigants, and deodorants. Chlorination is carried out at atmospheric pressure and moderate temperature. Benzol and chlorine are metered and brought together in presence of molybdenum chloride in the chlorinators, which are tall, cylindrical, cast iron vessels, agitated and equipped with condensers. A film of falling water on the outside helps control the reaction. Exit gases consist of unreacted benzol, hydrochloric acid, monochlorobenzol, ortho- and para-dichlorobenzol, and other reactants. Hydrochloric acid is recovered by a Fansteel absorber. The reaction products are pumped to caustic neutralizers. Unreacted benzol, monochlorobenzol, and dichlorobenzol are separated by distillation. Refrigeration is used to separate ortho-dichlorobenzol from para-dichlorobenzol. Para-dichlorobenzol crystallizes and is removed by centrifuging.—Chem Eng, N, 118

ADVANCED IDEAS IN PRODUCT DESIGN

Machines Welded — Designed for light tonnage with a comparatively large bed area, the 500-ton self-contained down-stroke hydraulic forming press of Lake Erie Engineering Co. has a welded-frame construction. Side frames consist of a heavy plate with stiffening ribs, and similar construction is used for top and bottom platens which are keyed and bolted to side members.—Prod Eng, N, 92

By redesigning its Terra Cobra heavy-duty earth scraper for welding and cutting, Wooldridge Manufacturing Co. reduced costs and speeded production. As many parts as possible have been designed for manufacture from flame-cut steel plate or simple rolled shapes by mechanized welding. The shipbuilders' technique of welding subassemblies and joining these by welding in the final assembly has been used to the limit.—Weld Eng, N, 44

Versatile Pneumatic Hammer — By changing the position of rotary valves, an operator can strike a single blow, a fixed number of blows per minute, or clamp work between the dies on the pneumatic hammer introduced by Erie Foundry Co., Erie, Pa. Valves which control application of air pressure to piston are operated by treadle or hand controls.

Time-saving Controls—On the Speed-matic lathe of Monarch Machine Tool Co., a control panel has switches that operate an electronic system for selective speeds and feeds quickly. Speed in surface feet is read directly on meters by turning a switch to the work diameter.—Prod Eng, N, 94, 103

FOG SHOOTING SAFER

Practically all danger of igniting gas and coal dust is eliminated in a new method of coal shooting developed by the Washington State coal mine inspection department. A "fog gun," made of ¾-in. pipe, and tapped about midway of its length by a ¼-in. pipe, is used to spray working. Compressed air passes through the ¾-in. pipe and passes over a water stream entering through the ¼-in. pipe. Nose of ¾-in. pipe is belled to lay fog over desired area.

Before shots are fired, fog gun is used to spray entire area, creating a dense fog. Shots are fired electrically, all at the same time.—Coal Age, N, 93

GLASS-FIBER ROOFING USED IN PLACE OF FELT

More than 500,000 sq. ft. of built-up glass-fiber roofing was used in place of conventional 4-ply felt roofing material on an Ohio manufacturing plant due to shortages of the felt. Application was simpler, and glass-fiber promises better serviceability. Contractor selected glass fiber because it is inert and inorganic, has zero capillarity, tensile strength equals felt when saturated with asphalt, and it is porous. In addition, it is considerably lighter than the felt and it is simple to get into corners and crevices in the roof.

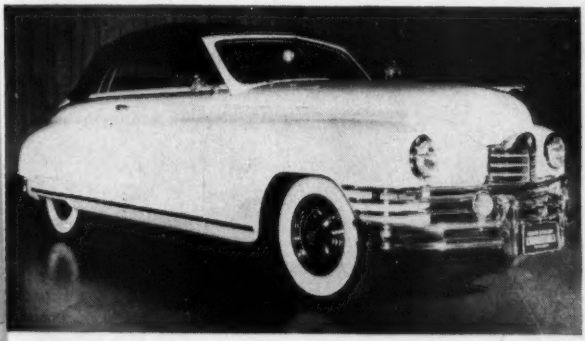
Roof deck was primed with hot pitch, plies of mat were run out dry and poured. Limestone chip crew followed. Top pouring on the glass mat was usually applied in such quantities as to impregnate all three plies but did not build up a volume of pitch on the surface until limestone chip crew followed with final pouring.—Eng News-Rec, N 13, 126

KILLS LIGHT GLARE

Glare from lights is curtailed by a new polarizing material, Polaply, which consists of a number of thin plastic sheets held between glass. It is said to polarize the light radially over 360 deg. It can be fitted into the bottom of a fluorescent lamp reflector, and will be made in disc shape, with hole in center, for insertion in bottom of lamp shades.—Business Week, N 1, 56

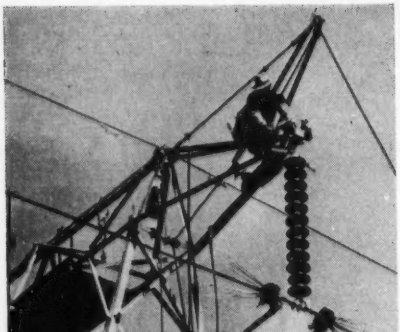
HUDSON—Only 5-ft. high, 1948 Hudson has stepdown floor 5 in. below top of frame siderail to give headroom. From cowl back, box-section frame is outside rear wheels. Uprights are welded to frame, and body panels are welded to uprights and lengthwise members. Three universal joints in drive shaft keep floor tunnels low. Rear seat is ahead of wheels, is 63 in. wide. This Commodore model has foam rubber upholstery. Wheelbase is 124 in.; engine is 6 cyl. (121 hp.) or 8 cyl. (128 hp.).—Amer Auto, D, 21

New in Autos



PACKARD — Windows, top, and front-seat adjustment are hydraulically operated in 1948 Packard convertible. Two ducts carry fresh air from front end to front seat compartment. Upholstery is vinyl plastic and bedford cord. Circuit breakers are used in electrical system. This model has 120-in. wheel base and 327-cu. in., 145-hp., 8-cyl. engine with 7 to 1 compression ratio.—Prod Eng, N, 90

SUPER CHIEF — Expected to be ready for dealers in early 1948, bantam convertible Super Chief of Keller Motors Corp. will have a rear-mounted engine, 25- or 49-hp. Plan is to keep price under $900. Wheels are on trailing arms extended from crosswise rubber torsion springs. Chassis is suspended from points below wheel center — Business Wk, N 1, 35



HOT LINES ARMORED—Conductor vibration on 220-kv. lines of California Edison has been reduced by armor rods and new low-loss aluminum insulator clamps. Ten 99-in. tapered aluminum armor rods were spiraled around the energized conductors at insulator-clamp points. The wrapping tool consists of two worm-driven, split steel disks with holes for the rods. These disks are in hinged cradles. Lower half of cradle is seated to conductor and the top half closed. The spiral wrapping is done by rotating disks by means of wood shafts driven by portable electric drills. Button clamp holds ends of rods.—Elec World, N 8, 47

OUTPUT RAISED 50%

When production of adding machines at Victor Adding Machine Co. was put on a mass-production, single-line basis, production rose 50%, worker fatigue and costs dropped, and working conditions improved. Originally, one production line was used for each of three models produced in large quantities, subassemblies being fabricated on each line although there was considerable duplication in subassemblies in each model.

Now subassemblies are preassembled and fed to line at proper point. Interior dead areas are used for storage of parts and subassemblies. Roller conveyors, at table height, move assemblies from bench to bench, eliminating lifting.—Factory, N, 98

MACHINE BUGDUSTING SAVES LABOR, CUTS COSTS

Use of Goodman "bugdusters" at Sahara Coal Co. gives safer operation through elimination of dust; saves hand labor, previously used to shovel bugdust; and provides cleaner kerfs, giving better shootings. Units are simple screw conveyors, 8 in. in dia., 30 ft. long, attached to shortwall machine. Chain drive powers duster.

Bugdust is discharged on trailing side of the shortwall machine, being piled parallel to and 6 ft. from face. Since helper does not have to shovel slack away from machine, he is free to do more productive work.—Coal Age, N, 79

EFFECTIVE SALES IDEAS

Sale of General Electric 60-watt lamps in a new four-lamp box proved popular with customers in five test cities. The box has been adopted as standard packaging for GE lamps.—Elec World, N 1, 22

Packaged fresh meat, sold in self-service manner, saves customer time, cuts floor space needed for meat department, relieves pressure on butchers during rush hours, gives better sales control, and adds to cleanliness, sanitation, and appearance of store. This new merchandising system has been tried successfully in several West Coast supermarkets.—Business Wk, O 25, 62

A Tacoma, Wash., cafe furnishes diners with glassine-lined, grease-proof paper bags so that meat scraps can be taken home to pets.—Business Wk, N 15, 58

NEW DEVICE MAKES SUPER AIR HIGHWAYS POSSIBLE

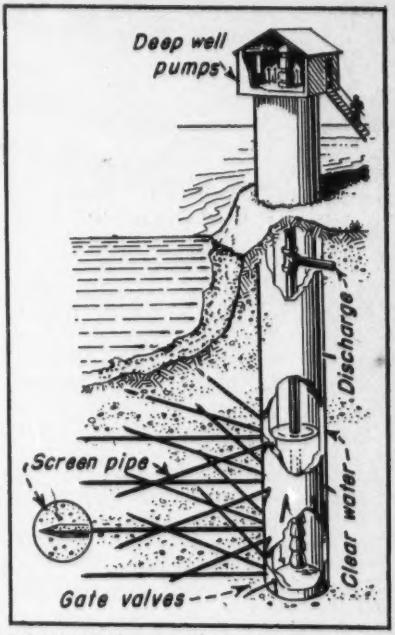
An "off course" control in a new bearing and direction computer permits 10 planes to fly the same course in the same direction at the same altitude in any weather. Developed by Minneapolis-Honeywell Regulator Co., the device makes possible 10-lane air superhighways. The electronic device takes information from omnidirectional range and distance measuring stations on the ground. Pilot draws a straight line between points of departure and arrival, then draws a perpendicular from line to ODR transmitter.

The perpendicular distance is the "offset" setting; distance between intersection to the destination is the "onset." These two figures are set into the machine along with the angle of course from true north. Two dials then show pilot what "track" he should fly and the distance to his destination. A third dial can be added to show estimated time of arrival, permitting pilot to adjust throttles.

The bearing and direction computer is currently undergoing flight tests by the Civil Aeronautics Administration.—Air Trans, N, 39; Business Wk, N 8, 66

NEW TEXTILE CHEMICALS

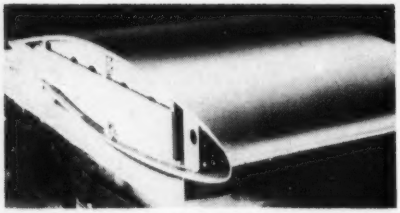
Five new textile dyestuffs have been announced by General Dyestuff Corp. Rapidogen Blue R is a stable azoic soluble in alkali which, after printing and aging, has good fastness. . . . Anthracene Blue Bra Conc. CF on woolens and worsteds has a bloomy navy shade; it is fast. . . . Rapidogen Bordeaux RN is a stable azoic soluble in alkali and when developed by acid or vat aging, has good fastness on cotton or rayon. . . . Rapid Fast Brown 1RH powder yields a reddish-brown on cottons and rayons; it also is a fast color. . . . Palatine Fast Blue 5RNA-CF is a metallized-acid dye for wools or worsteds. It approaches the fastness of chrome dyes.—Textile World, N, 168



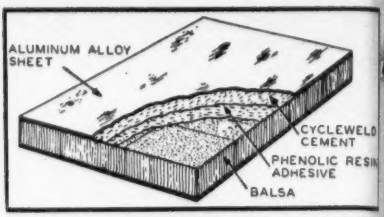
HIGH-CAPACITY WELL—Widespread industrial application now is being made of the Ranney water collector. Typical installation has reinforced concrete caisson, 13 ft. I.D. and 72 ft. long, extending 50 ft. below grade. At four levels, perforated 10-in. steel pipes extend horizontally from caisson into water-bearing ground. There are 14 of these, varying in length from 33 to 241 ft. This taps a large area of water-bearing ground, and clear water flows into caisson, where there is a deep-well pump. Some units produce 15 million gal. a day.—Chem Eng, N, 120

TESTING EMPLOYEES PAYS

Instruction time is reduced and better employees result through use of 28 preemployment tests given to applicants at National Cash Register Co. Tests have been developed over a period of years to test general information, mathematical skill, manual dexterity, personality traits, job interest, and range of occupation interest.—Factory, N, 126



1 Wing of Metalite sandwich material shows low drag without filler or finish.



2 Construction of Chance Vought's Metalite panel. Grain is normal to metal face

Aircraft Sandwich Structures

Designers are turning increasingly to sandwich structures. Chance Vought to produce a jet fighter almost entirely of sandwich materials

Need for strong lightweight structural materials with high structural efficiencies has turned aircraft designers and manufacturers to sandwich structures. Progress is still mainly in the development stage, but Chance Vought has been given a contract to produce an XF6U-1 jet fighter almost entirely of sandwich-material components.

Chance Vought has developed a sandwich material, called Metalite, of two aluminum alloy faces bonded to a balsa core. Glenn L. Martin uses two aluminum alloy faces over a resin-impregnated paper, formed into a honeycomb. Aluminum Co. of America's material is similar but uses an aluminum-foil honeycomb. An all-metal sandwich material is being tested by North American.

In the Chance Vought Navy plane, wood core is bonded with grain normal to the metal face in a two-stage process. Cycleweld C-3 cement is sprayed on the face material, then it is oven-cured to provide a tough elastic priming film. Actual bonding of the metal to the core is with Durez, a medium-temperature phenolic resin. Metalite has already been used in airframes of two Navy planes and in the stabilizer of another.

Comparative values of strength and weight for conventional and sandwich materials used in a horizontal stabilize show the sandwich material to be 2 l lighter yet have 65% greater strengt

Since possible width of aluminum fac sheets is limited, bonded splices are fr quently employed by routing out t core and inserting a metal strip benea the butt joint of the adjacent face.

Conventional riveting cannot be us on Metalite components, and mahogan phenolic, or aluminum inserts sometim are inserted to absorb the driving forc Blind rivets are most frequently use since they reduce the driving force. Bea ing strength is increased by bondi doublers to face at the joint, thus pe mitting the use of larger hollow rive and wider space between them for a tot weight saving. If flush-type rivets a used, face sheet can be countersunk inserting a standard rivet into hole a tapping it.—Aviation Wk, N 3, 28

DEVELOPS NEW COLOR FILM

A new color film that can be processed fast and simply as black-and-white f has been developed by E. I. du Pont Nemours & Co., Inc., for portrait a still photography. Called "S-T Tripa it can be used in any back-plate camer Front support carries two emulsion l

ers recording blue and green, rear emulsion records red, giving three separations. Aside from transferring technique, processing requires few special chemicals.—Business Wk, N 1, 56

NEW DEVELOPMENTS IN TEXTILE MACHINERY

Spins Rayon Continuously—Continuous spinning of rayon is possible on a miniature machine developed by H. A. Kuljian. Ten rollers, 16-in. long, each carry out a separate process. Necessary liquids are fed to rollers at pre-determined rate, skewing of rolls causes yarn to advance as slowly or as rapidly as desired.

Rollers are hollow and have holes running from surface to center, preventing mixing of liquids and permitting removal of one or all of the liquids for washing.

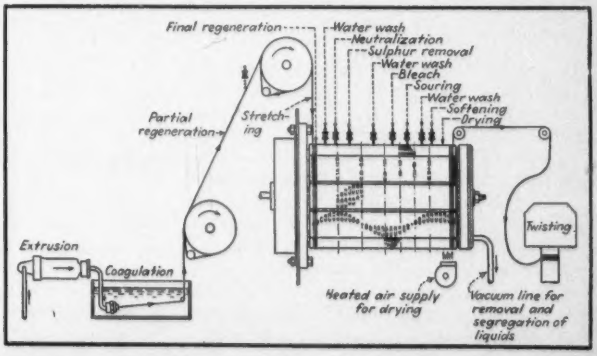
Machine runs at rate of 5 ft. per sec., needs only ⅓ the water used by the large machines now in use.

Hydraulic Rope Squeezer—A rope squeezer with adjustable pneumatic pressure on rolls has been introduced by Weisner-Rapp Co. Dial indicates roll pressure. Roller bearing units on roller nearest pneumatic cylinders are on rails to permit entire roller assembly to ride back and forth, depending on cloth thickness. Squeeze rollers are located side by side instead of one on top of the other.

Circular Jute Loom—A circular loom for tubular jute sacking has been developed by Saint Freres, France. Loom operates at 75-90 rpm. with 3-4 shuttles producing 300 circular picks per min. There is no shock in picking motion. Loom and shuttles come to a gradual stop when loom knocks-off.—Textile World, N, 157, 158, 162

REMOTE HYDRAULIC CONTROL

Using a new method for the control of remote hydraulic valves, a recently developed all-hydraulic control system is lighter and less expensive than many mechanical and electrical systems now in use. This Air Associates, Inc., device will control the flow of hydraulic fluid in lines of any capacity up to 3,000 psi. and higher. If the control knob on the pilot valve is turned, an eccentric lifts a spring-loaded poppet valve, and oil flows from one of the pilot valve lines to waste. This destroys the hydraulic pressure equilibrium in the remote valve so that a main poppet valve raises against a spring, and oil flows through. Closing the pilot valve quickly restores pressure equilibrium to close the main valve, there being a bleeder hole in the latter valve. Four main valves and a two-in-one pilot valve are used to obtain proper operating characteristics.—Prod Eng, N, 136



With miniature rayon spinning machine, the treating processes are carried out on the skewed rollers following conventional spinning, coagulating, and accelerated regeneration.

ALL-WELDED RESERVOIR COMPLETED IN 10 WEEKS

Completion of a 10-mg., all-welded steel reservoir near Seat Pleasant, Md., was completed in 10 weeks even though materials were delayed. Located in a hilly area, sides did not have to be excessively high to provide flow. Ground was leveled and surfaced with a 2-in. sandfill to reduce corrosion on underside of bottom. Bottom sloped 0.5% to center.

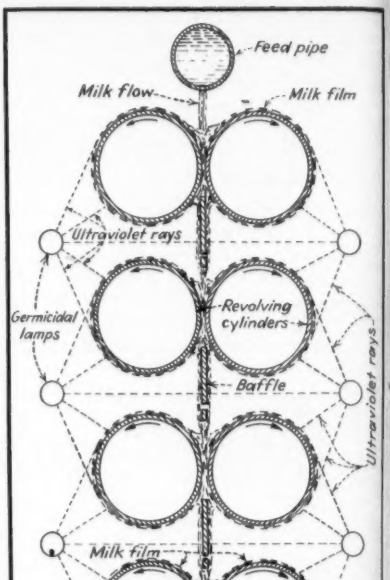
An 8-ft. wide center strip was laid first, then welders worked in opposite directions across bottom. Several bottom sheets were tack-welded in place, final welding following. Side walls consisted of three rings of steel plate 7 ft. wide, 31¼ ft. long, and varying in thickness from 1 in. for bottom plates to 0.3 in. for top plates. First two rings of plate were lifted into place by a crawler-tractor with adjustable side boom. As plate was raised into place it was tack-welded before final joining; vertical joints were butt-welded. For top ring, two 40-ft. gin poles raised plates. Plates were held in place temporarily by 5-in. vertical channels 4 ft. long. The 30 plates were placed in less than 8 hr.

Roof was supported on seven concentric circles of columns, spacing between columns being 18¾ ft. A 10 x 10 x ½-in. plate atop column was attached to roof beams.—Eng News-Rec, O 30, 51

KNITS PILE FABRICS

A process to knit rug or carpet fabrics with a cut or uncut pile surface has been announced by Leicester College of Technology, England. Production of fabrics is more rapid than by weaving, and modification of standard knitting equipment is simple. The new pile fabric has a base knitted structure and a laid-in, pile-formed filling protruding from the structure as a cut or uncut pile.

The jute filler yarn gives stiffness to supporting fabric. Yarn filler passes through an aqueous dispersion of polyvinyl acetate, containing 50% by weight of solids and without plasticizers. It is applied during yarn feeding and sets rapidly. Any flat-bar, latch-needle, rib knitting machine can be converted with little trouble.—Textile World, N, 149



ULTRAVIOLET PASTEURIZER — Bacteria count of milk is reduced to less than 2,500 per cc. by cold pasteurization with ultraviolet light in a unit developed at Juice Industries, Inc. A 1/64-in. film of milk flows over revolving cylinders, and is exposed to ultraviolet. Product feeds into space between cylinders, is carried over and around by their rotation, and is removed at contact point of baffle and cylinders. Speed of cylinders is just sufficient to carry milk past points of gravity pull. Fluid tends to drag, creating turbulence which exposes all of milk to ultraviolet.—Food Ind, N, 84

ELECTRIC MICROMETER HAS MANY APPLICATIONS

Developed by the Bureau of Standards, an electronic micrometer operates on the shielding principle. Placed at various distances from a high-frequency, ac. coil, a low-resistance conductive medium varies the amount of current induced in an adjacent coil to give a linear reading on a meter. When used as a micrometer, the coil assembly is mounted on a movable shaft so it can be caused to approach or recede from a metallic plate. The material to be measured is pressed lightly between the pick-up coil and the plate. When the material is removed, the amount of current generated in the coil is an indication of the thickness of the material which occupied the space. The meter is calibrated in thousandths of an inch.

The principle can be employed in a phonograph pickup. Vibration of a flat plate armature fastened to the needle causes alternation in the output of the pick-up coil. In a microphone, movement of a metal diaphragm varies the coil output. The device also can be used as a thermometer or tachometer. In the latter, end plate of flyball governor will actuate instrument.—Prod Eng, N, 151

EFFICIENT DESKS—This "Circladesk" has spacious top and open compartments on both sides of typewriter well. It is a C. G. Morgan Co. development. A Sterling Mfg. Co. desk briefs the boss on appointments as he enters the office. A photocell starts a transcribing machine as he opens the door—Business Wk, N 8, 26

NEW CHEMICAL PRODUCTS

Wide use as a basic organic chemical is expected for beta-propiolactone, now in experimental production at B. F. Goodrich Chemical Co. It may make possible the production of a number of new chemicals and lead to new and cheaper methods of making many basic materials already used. Substances which may be made from the new material include: leather processing materials, fats and oils, preservatives, thermosetting resin products, plant-growth initiators, and mold inhibitors. The list also includes synthetic rubbers, fungicides, weed killers, polymerizable esters for plastic products, intermediates for the paint industry, and rubber compounding chemicals and solvents.

Allyl starch, produced in a pilot plant of General Mills Research Labs., has potential use as a protective and decorative coating on wood, glass, or metal, a thermosetting adhesive, printing ink base, textile finish, leather dressing, for impregnating and grease-proofing paper, and in nail polishes. When vulcanized, it forms a rigid plastic and is of interest as a laminating agent.

Composed to a large extent of phosphorous pentoxide, a new glass to be made by Houdry Process Corp. is the first glass known to resist hydrofluoric acid.

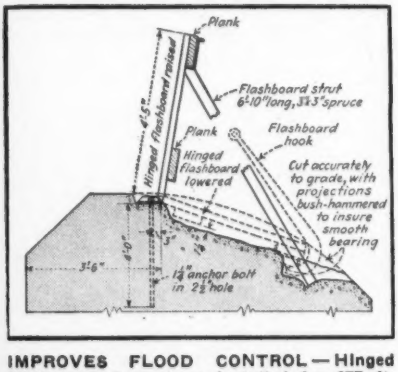
Anti-acid lubricant introduced by James K. Harbinson & Co. is claimed to be unaffected by mineral acids and mild caustics and to protect metal against direct acidic attack or corrosive action of vapors.—Chem Eng, N, 175, 176

TECHNICAL SHORTS

Germans Chromise Steel—To improve the surface properties of metal products, the Germans used a "chromising" process for diffusing a volatile chromium compound into steel. The technique was applied to valves, preheater tubes, bolts, milk hose connectors, and milk cans. The valves were especially resistant to corrosion.—Prod Eng, N, 158

Auto Ride Control—New Rolls-Royce and Bentley cars have an adjustable shock-absorber mechanism for hard or soft riding, with control on steering wheel. Another innovation is a pedal which, at a single stroke, lubricates more than 25 points.—Am Mach, N 20, 138

Baceteria Consume Waste—Methane-producing bacteria will be used to consume the solids in citrus waste in a pilot disposal plant at Florence Citrus Growers Assn. It is hoped that enough methane will be produced to be used as fuel.—Food Ind, N, 130



IMPROVES FLOOD CONTROL—**Hinged flashboards have been installed for 377 ft. along the reduced crest of Central Maine Power's Shawmut station dam on Kennebec River. Advantages realized are: a reduction of high-water hazards through free flow of excess water, greater safety in operations, and elimination of losses of old-type boards, often $2,200 annually. Drawing shows hinge and seating arrangements, strut and hook positions. Struts are easily removed or replaced while raising or lowering panels by gantry crane. Recessions in dam prevent damage from ice and debris when panels are down.—Elec World, O 11, 108**

Fast Road Work—Traveling faster than 10 ft. per min., an asphalt paver spreads 12-ft. widths of crushed slag in 4½-in. layers (4-in. after compacting) on a macadam highway project in Maryland. Total pavement depth is 13-in.—2 in. of screenings, 4 in. of water-bound macadam, 4 in. of penetration macadam, 3-in. surfacing of plant-mixed asphaltic concrete in two 1½-in. layers.—Cons Meth, N, 100

Big Transformer Switched Hot—Modesto Irrigation District switches a spare 10,000-kva. transformer in and out of a bank without deenergizing and while bank is carrying load. This is done with air switches.—Elec World, N 8, 112

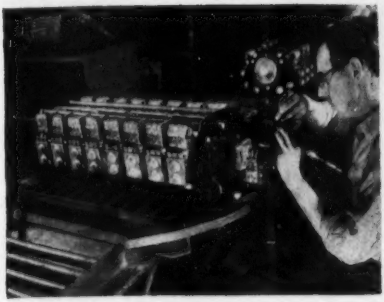
Cylindrical Cooling Tower—Reported to be the first of its kind, the cylindrical cooling tower of Santa Fe Tank & Tower Co. is designed to eliminate dead air spaces and allow air to enter tower from any point on 360-deg. circumference. Wind load, is lower also.—Chem Eng, N, 166

Trains Truck Operators — When William Whitman Co. added a fleet of fork-lift trucks for materials handling within its plant, a training course was conducted for drivers. Lines were painted on parking lot to represent tight production areas and aisles, and trainees practiced for 10 hr. before taking truck into plant. There have been no accidents within the plant.—Textile World, N, 113

Flame-cut Flywheels—Disk flywheels which are flame-cut from large rolled steel plates are cheaper than cast rim-and-arm flywheels and have largely replaced them. The disk flywheel also has less weight, smaller diameter, higher rim speeds, better balance and stability, and greater safety.—Prod Eng, N, 141

Meat for Babies—Babies only 6 weeks old were fed strained beef, veal, lamb, and pork in tests conducted by the University of Nebraska. After feeding meat to infants, doctors found babies' blood has a better value and babies were less fussy and slept better than babies not fed meat.—Science Ill, N, 64

Rails Revamped—Future U. S. railroad rails will have a changed cross-section. In effect the web is turned upside down and thickened. 41.8% of rail failures between 1935 and 194 were in the web.—Am Mach, O 9, 109



SIMPLIFIES ASSEMBLY—At several pneumatic transfer switch inspection and assembly stations along roller conveyors at Allis-Chalmers Mfg. Co., turntables have been installed. Switch units are mounted on steel plates for movement along conveyors, and the assemblies can be turned to suit the convenience of the workers. Operations are easier to perform, fatigue is reduced, production increased.—Am Mach, N 6, 108

Bulldozer Does Shovel Cleanup—At Windsor Coal Co. strip mine, a bulldozer moves in to push coal against bench as a horizontal-thrust shovel loads truck. Bulldozer frees 3 to 4 men formerly used to hand-shovel loose coal. Special heel is bolted to bulldozer blade to keep it from biting into clay bottom.—Coal Age, N, 108

Reduces Record Noise—Phonograph-record noise can be reduced without substantially affecting desired signal by a simple circuit employing germanium diodes as nonlinear elements which pass useful signal and discriminate against noise. Bandpass filters (3-6 kc.) which pass frequencies over an octave range are used as input and output of nonlinear element. A low-pass filter (0-3 kc.) also is used.—Electronics, D, 118

Nears Supersonic Barrier—Mach number 0.92 was reached recently by a Bell XS-1 at an undisclosed altitude, the highest speed yet attained by a piloted aircraft. During recent flights, plane showed a tendency toward violent diving at high speeds but modifications have eliminated this.—Aviation Wk, O 27, 12

Stereoscopic Microscope—Useful in precision metalworking operations and inspection processes, the Spencer stereoscopic microscope announced by American Optical Co. shows length, width, and depth. Powers are 9, 18, and 27X.—Am Mach, N 20, 166

Powdered-metal Technique—Highly intricate dies employing a number of independent punches fitted into a die sub-press were used by the Germans in pressing rifle and gun parts from powdered metals. The entire assembly was designed for use in a standard hydraulic press with top and bottom rams. This eliminated the need for complicated presses with multiple die movements.—Prod Eng, N, 116

Simple FM Carrier—For open-wire telephone lines 20-30 miles long, a simple, low-cost, frequency-modulated carrier system operating in the 100-400 kc. range has been introduced. Permitting three carrier channels, the system has 50-kc. separation between channels to simplify filter design and manufacture. Equipment for separating normal speech channel from carrier also is simple—Electronics, D, 162

Simplifies Bar Stock Storage—Bar stock is stored at Buliard Co. on "telephone pole" racks, rack uprights being fabricated from standard H-sections, crossarms of standard I-beams. Gaps in crossarms, 3 ft. wide, are bridged by removable, high-strength aluminum alloy bridges. Overhead crane handles stock through crossarm gaps. Each rack holds 90 tons.—Factory, N, 71

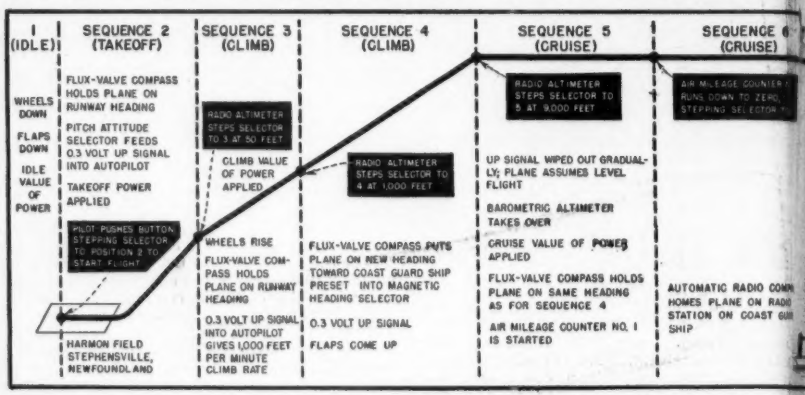
Plastic Cheese Box — Camembert cheese wedges now are packed three to a half-moon transparent plastic box by Kraft Foods Co. The polystyrene container not only permits cheese to be seen but is reusable as a trinket box.—Food Ind, N, 114

Precast Roof-floor Unit—New precast, prestressed, steel reinforced, hollow-beam concrete roof or floor units speed residential or industrial construction. Units are 7¾x7¾ in. with a 6-in. hole running the full length of 30 or 40 ft. Air space acts as insulation and affords access for piping and wiring.—Eng News-Rec, N 13, 174

11 Million Pictures a Sec.—By doing away with shutters and using a system of lenses which dissect images coming through the opening, University of Rochester scientists have developed a motion picture camera that takes 11 million pictures a second. The fine strips of dissected light later are projected onto a final film.—Am Mach, N 20, 131

Diamonds Detect Radiation—Studies at National Bureau of Standards show that diamonds are highly sensitive to gamma rays and may be used like a Geiger-Müller counter. Diamond is held between 1,000-volt electrodes. Radiation produces pulses of current across electrodes.—Nucleonics, N, 80

PILOTLESS TRANS-ATLANTIC FLIGHT OF U. S. ARMY PLANE AR


1 (IDLE)
SEQUENCE 2 (TAKEOFF)
SEQUENCE 3 (CLIMB)
SEQUENCE 4 (CLIMB)
SEQUENCE 5 (CRUISE)
SEQUENCE 6 (CRUISE)
WHEELS DOWN
FLAPS DOWN
IDLE VALUE OF POWER
FLUX-VALVE COMPASS HOLDS PLANE ON RUNWAY HEADING
PITCH ATTITUDE SELECTOR FEEDS 0.3 VOLT UP SIGNAL INTO AUTOPILOT
TAKEOFF POWER APPLIED
PILOT PUSHES BUTTON STEPPING SELECTOR TO POSITION 2 TO START FLIGHT
HARMON FIELD STEPHENSVILLE, NEWFOUNDLAND
RADIO ALTIMETER STEPS SELECTOR TO 3 AT 50 FEET
CLIMB VALUE OF POWER APPLIED
WHEELS RISE
FLUX-VALVE COMPASS HOLDS PLANE ON RUNWAY HEADING
0.3 VOLT UP SIGNAL INTO AUTOPILOT GIVES 1,000 FEET PER MINUTE CLIMB RATE
RADIO ALTIMETER STEPS SELECTOR TO 4 AT 1,000 FEET
FLUX-VALVE COMPASS PUTS PLANE ON NEW HEADING TOWARD COAST GUARD SHIP PRESET INTO MAGNETIC HEADING SELECTOR
0.3 VOLT UP SIGNAL
FLAPS COME UP
RADIO ALTIMETER STEPS SELECTOR TO 5 AT 9,000 FEET
UP SIGNAL WIPED OUT GRADUALLY; PLANE ASSUMES LEVEL FLIGHT
BAROMETRIC ALTIMETER TAKES OVER
CRUISE VALUE OF POWER APPLIED
FLUX-VALVE COMPASS HOLDS PLANE ON SAME HEADING AS FOR SEQUENCE 4
AIR MILEAGE COUNTER NO. 1 IS STARTED
AIR MILEAGE COUNTER RUNS DOWN TO ZERO, STEPPING SELECTOR
AUTOMATIC RADIO COMP HOMES PLANE ON RADIO STATION ON COAST GUA SHIP

WITH NO HANDS on the controls from takeoff to touchdown, a U. S. Air Forces C-54 transport recently crossed the Atlantic. This brings closer to realization the airline operator's goal of all-weather flying, with greater safety and comfort and adherence to schedules. The electronic, electrical, and mechanical sensing controls are smoother and more responsive than human senses, correcting forces being applied almost at the instant of flight deviation. Basically, the automatic flight controller is an electronic brain that manipulates three knobs to which all flight controls are coupled. Two of these knobs are part of a standard automatic pilot, and provide for right-left and updown maneuvers; the third is a new single control to change power settings of all four

AIR CONTROL SIMPLIFIES WORK ON SMALL PARTS

Production of awkward or small low-cost parts frequently can be aided pneumatically. Much of the mechanism of special machines for making these pieces is necessary to synchronize moving parts and for the transfer of mechanical reactions. An air system will help to avoid complex mechanical arrangements by taking advantage of the inherent flexibility of air.

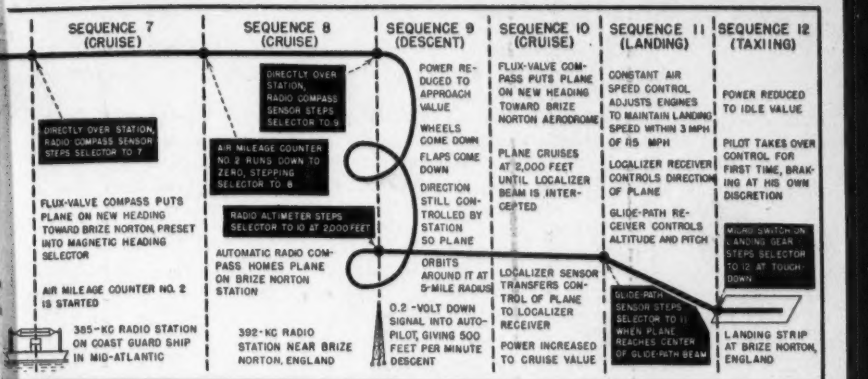
One or more indexing dial plates, locked at each working position by retarding pawls, are indexed to a new position by the reciprocating action of a gib-restrained slide moved through a cushioning spring by a double-acting air cylinder. The slide carries a power pawl which does the actual indexing, and it has a pin to operate the retarding pawl. A dowel plate has locating holes or nesting plates or pins for the parts

Several operations may be performed at the individual work stations by standard machines, as riveters or presses, or special fixtures. All of these machines must be synchronized mechanically or through cam-actuated air valves. Where possible, midget air cylinders are used for tripping triggers or treadles of the machines.—Am Mach, N 6, 101

COATS CAR UNDERCARRIAGE

Use of rubber and asbestos spray coating on undercarriage of automobile trucks, and buses gives a much quieter ride. Applied to fenders, flooring, splash boards, bumpers, and inside door caps, it protects against abrasive agents, rust and corrosion, and deadens impact noise from objects thrown up from the road. A ½-in. thick coating should be applied.—Am Auto, N, 52

ARKS SIGNIFICANT STEP FORWARD IN ALL-WEATHER FLYING


SEQUENCE 7 (CRUISE)
SEQUENCE 8 (CRUISE)
SEQUENCE 9 (DESCENT)
SEQUENCE 10 (CRUISE)
SEQUENCE 11 (LANDING)
SEQUENCE 12 (TAXIING)
DIRECTLY OVER STATION, RADIO COMPASS SENSOR STEPS SELECTOR TO 7
FLUX-VALVE COMPASS PUTS PLANE ON NEW HEADING TOWARD BRIZE NORTON, PRESET INTO MAGNETIC HEADING SELECTOR
AIR MILEAGE COUNTER NO. 2 IS STARTED
385-KC RADIO STATION ON COAST GUARD SHIP IN MID-ATLANTIC
DIRECTLY OVER STATION, RADIO COMPASS SENSOR STEPS SELECTOR TO 9
AIR MILEAGE COUNTER NO. 2 RUNS DOWN TO ZERO, STEPPING SELECTOR TO 8
RADIO ALTIMETER STEPS SELECTOR TO 10 AT 2,000 FEET
AUTOMATIC RADIO COMPASS HOMES PLANE ON BRIZE NORTON STATION
392-KC RADIO STATION NEAR BRIZE NORTON, ENGLAND
POWER REDUCED TO APPROACH VALUE
WHEELS COME DOWN
FLAPS COME DOWN
DIRECTION STILL CONTROLLED BY STATION SO PLANE
ORBITS AROUND IT AT 5-MILE RADIUS
0.2-VOLT DOWN SIGNAL INTO AUTOPILOT, GIVING 500 FEET PER MINUTE DESCENT
FLUX-VALVE COMPASS PUTS PLANE ON NEW HEADING TOWARD BRIZE NORTON AERODROME
PLANE CRUISES AT 2,000 FEET UNTIL LOCALIZER BEAM IS INTERCEPTED
LOCALIZER SENSOR TRANSFERS CONTROL OF PLANE TO LOCALIZER RECEIVER
POWER INCREASED TO CRUISE VALUE
CONSTANT AIR SPEED CONTROL ADJUSTS ENGINES TO MAINTAIN LANDING SPEED WITHIN 3 MPH OF 115 MPH
LOCALIZER RECEIVER CONTROLS DIRECTION OF PLANE
GLIDE-PATH RECEIVER CONTROLS ALTITUDE AND PITCH
GLIDE-PATH SENSOR STEPS SELECTOR TO 11 WHEN PLANE REACHES CENTER OF GLIDE-PATH BEAM
POWER REDUCED TO IDLE VALUE
PILOT TAKES OVER CONTROL FOR FIRST TIME, BRAKING AT HIS OWN DISCRETION
MICRO SWITCH ON LANDING GEAR STEPS SELECTOR TO 12 AT TOUCHDOWN
LANDING STRIP AT BRIZE NORTON, ENGLAND

engines simultaneously. The controller stores information given to it before the flight begins, reads the flight instruments through dozens of selsyns, listens to radio signals, measures distances and air speed, and coordinates all this to carry out for pilot and crew all functions required for point-to-point flight from one airfield to another. The various instruments that take over control of the autopilot during the different flight stages are energized and deenergized in turn by a 6-bank, 12-position stepping switch known as the automatic sequence selector, used in conjunction with 12 relays. The 12 operational sequences for the trans-Atlantic flight, together with the flight control actions in each sequence, are indicated in the above diagram.—Electronics, D, 88

RAILROAD EMPLOYS PORTABLE RADIOPHONE

Pennsylvania Railroad has placed six portable inductive FM radiophones on two of its lines to extend the scope of the inductive telephone system used for several years. Operating on 80 kc., the 25-lb. shoulder-strap units furnish communication from one train to another up to 2 miles or to way stations as far as 20 miles. A trainman may leave the immediate vicinity of his train and keep in constant touch with it, with other trains nearby, or with way stations. A trainman inspecting a disabled car can report the trouble to either end of the train and issue instructions for corrective procedures. News of the emergency condition can be swiftly relayed to a dispatcher.

Other applications are seen. In work trains, for example, the foreman could direct and coordinate the operations of derricks and various work machines from a single location. Furthermore, he can keep informed of train movements and take better advantage of lulls in traffic.

The radiophone utilizes a modulated carrier wave that is transmitted over paralleling line wires and to some extent the track rails.—Electronics, D, 93

WHAT SIZE IS HOT WORK?

Because of different coefficients of expansion for gage and workpiece, an aluminum part 10 in. in diameter should measure 0.0013 in. oversize at 90°F., with a steel gage, to be correct at 68°F. With magnesium, difference is even greater.

One solution to the problem is to add to the part planning sheet mean adjusted dimensions in steps of 4°F. for each important dimension of the work. Temperature can be checked by a surface pyrometer in 5 sec.—Am Mach, N 20, 101

More Efficient Steam Plants

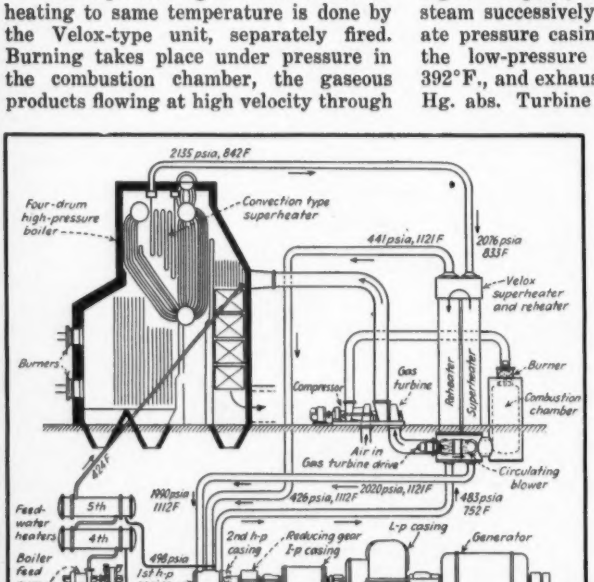
Raising temperature will improve performance in steam-turbine plants. Leading authority proposes a practical design, gives heat balance

Steam-turbine power plants, as well as gas-turbine plants, can improve performance by raising temperature, says Dr. Adolphe Meyer, chief consulting engineer, Brown, Boveri & Co. The heat-balance diagram is shown for the most practical of several high-temperature schemes studied. A standard-design boiler produces steam at 2135 psia. and 842°F.; it requires no special superheat control and uses ordinary steel for superheater tubes.

Final superheating to 1112°F. and reheating to same temperature is done by the Velox-type unit, separately fired. Burning takes place under pressure in the combustion chamber, the gaseous products flowing at high velocity through superheater and reheater for high heat-transfer rates. Pressurized combustion air is produced by an axial-flow compressor driven by a gas turbine which takes its gas from the exhaust of the Velox unit and which discharges into the boiler.

Steam enters the first casing of the 4-casing turbine at 1990 psia. and 1112°F., exhausts to reheater at 483 psia., 752°F., enters second high-pressure turbine casing at 426 psia., 1112°F. From there the steam successively enters the intermediate pressure casing at 64 psia., 662°F.; the low-pressure casing at 21 psia., 392°F., and exhausts to condenser at 1.15 Hg. abs. Turbine can be constructed of prewar high-temperature steels.

Decomposition of steam into hydrogen and oxygen, often raised as an objection to use of high-temperature steam, does not occur because the superheater tube temperature is only about 1200°F. On the other hand, the chemical reaction $3Fe + 4H_2O = Fe_3O_4 + 4H_2$ is a function of temperature. At 925°F., cases are



Proposed layout and heat balance of 50,000-kw. steam-turbine plant with 1112°F. and 1990 psia. initial steam conditions. It uses a Velox-type superheater and reheater and a 4-cyl. turbine.

known where troubles have occured from this cause. One station slowly raised temperature and pressure of boiler to form a permanent protective oxide coating on the tubes. For creep strength, steels in the separate superheater have high chromium content, and this makes them highly resistant to corrosion.

The turbine and feed-heating cycle of this high-temperature plant can produce energy at a thermal efficiency of 43.3%, and the overall station heat rate will be between 9,300 and 9,800 Btu., depending on type of steam-generating equpiment. Figures are based on experience, with extrapolations into the high-temperature region.—Power, N, 69

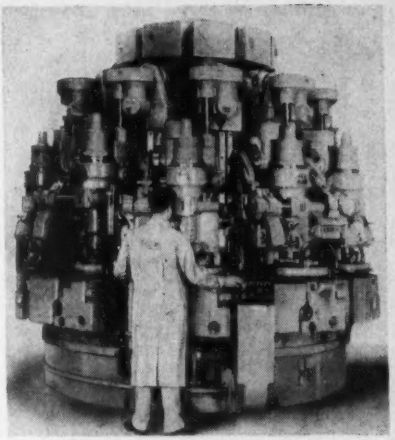
STANDARD PREFAB PARTS CUT SUBSTATION COSTS

Standardized structural parts can be assembled to form complete substation structures with the Erecticon design developed and used extensively by Consumers Power Co. Engineering time and cost are minimized, and field assembly of the shop-fabricated parts is simple. Total cost of completed structure is about half that of conventional construction.

Main supporting members, both columns and trusses, are identical. They are made up of prefabricated lightweight welded sections. These members are of 12x30-in. uniform cross section, and lengths are in multiples of 4 ft. These members are lattice-type construction having 3-in. chord angles. Each chord angle has holes at 3-in. intervals that permit an almost unlimited variation of assembly. The welded sections can be bolted end-to-end with internal tension bolts. Splice plates have been used in a few instances.

For mounting trusses and equipment, and for various attachments to the structure, standardized channels, angles, brackets, and plates have been designed. All of these structural parts have holes at 3-in. intervals.

Foundations for all substations are the same design, but width may vary by 4-ft. intervals. Standardized forms can be used for any width of foundation, are easily removed for reuse.—Elec World, N 8, 106



TEN MACHINES IN ONE—Ten individual and complete gear-cutting units, turret mounted to rotate in either direction, comprise the No. 10 rotary gear shaper developed by Fellows Gear Shaper Co. Each unit can be arranged for a different gear, or all can be set up on the same gear. Each "station" has its own timing control, and the machine itself is operated from a convenient pushbutton panel. Capacities are 12-in. pitch dia., 3-in. face width, and diametral pitch of spur ¾, helical 5/7. Designed for labor and space savings, machine is 12 1/3 ft. wide, 13½ ft. deep, 11½ ft. high.—Am Mach, N 6, 161

FEEDERS SPEED PRESSES

With automatic mechanical feed, a metalworking press may produce two to ten times as many pieces per hour as with hand feeding. Press feeds also can increase an operator's efficiency by reducing fatigue, and one operator often may tend several presses equipped with such feeds. Increased safety is another advantage.—Am Mach, N 20, 85

COCKPIT POSITION CONTROLS HELICOPTER

A revolutionary helicopter has been developed by Charles Seibel. Lateral and longitudinal control is obtained by moving the center of gravity with respect to lift vector during flight by shifting the forward part of the cockpit forward, backward, or side to side on a trestle-like structure.

Since the entire cabin moves, movement is not apparent to occupants. Control force required to control the helicopter in hovering flight has been reduced virtually to zero. Cabin suspension provides dynamic stability in hovering flight, relieving pilot from having to "fly" the ship constantly. This contrasts with standard cyclical control in standard helicopters where pitch of rotor blades is constantly changed.

In Seibel's helicopter, all of the close-tolerance parts of the cyclical system are eliminated. A central control stick is attached at lower end with a swivel fitting to fuselage structure, center of the stick being pivoted on the movable-cabin portion of the helicopter. Movement of the top of stick forward moves the cabin forward. Force from the rotor is not transmitted to pilot's hand.

Both lift and auxiliary rotors are two-bladed, eliminating necessity for drag hinges and blade dampeners. Rotor hub has provisions for only two motions between blade and hub—coning-flapping and collective or simultaneous pitch change. Blade attachment has no machined parts, no ball bearings, and no lubricating problem. Rotor hub consists of two intermeshing aluminum castings hinged on a common flapping and coning axis at center of rotation. Two needle bearings give freedom of motion. Sheet-metal angle is attached to castings, center end of the angle being attached to blade. Blade-pitch change can be obtained by twisting the angle throughout the necessary angular range.

Auxiliary rotor is also simple in construction, using two instead of seven or eight bearings. These two bearings are on each end of the support shaft.

Free-wheeling unit and rotor brake, necessary in standard helicopter transmissions, are eliminated. Engine drives rotors directly through a disk clutch. Engine is a 65-hp., 2,200-rpm. Franklin. Gross weight is 800 lb.; top speed, 90 mph.; cruising speed, 70 mph.; climb, 900 fpm. to a service ceiling of 12,000 ft.—Aviation Wk, N 3, 22

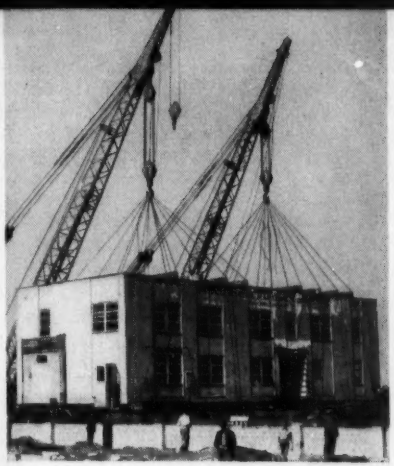
RECENT PROGRESS IN FOOD TECHNOLOGY

Continuous Process—Machines for making jams, jellies, preserves, or marmalades continuously at a rate of 30,000 to 120,000 lb. per 8-hr. shift have been designed by Dr. G. T. Reich. The compact units consist of a preheater, sugar dissolver or mixer, vacuum tank, and inversion tank. Automatic controls require only two attendants. Features of units are: synchronous operations; little loss of constituents, due to low temperatures used; low steam pressure in heating jacket; and easy interchange of parts when shifting products.

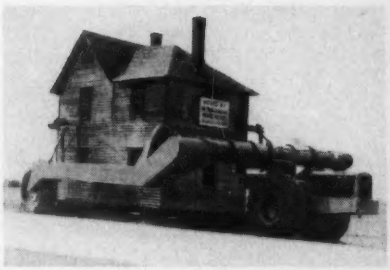
New Cheese Curd Treatment — Cheese curd is firmed and dried after first of whey is removed in a new process of Kraft Walker Cheese Co. Pty., Ltd. Curd is transferred by centrifugal pumps from vat to a rotatable perforated drum, supported on a tiltable frame. After batch has been pumped into drum, it is rotated at high speeds, discharging whey through perforations, the whey being collected on trays and delivered to launder. The drum is tilted, dropping dry curd into receiving vat.

Citric Acid from Molasses — Russian scientists have discovered a fungus that ferments molasses into citric acid, the acid output being 50% greater than from pure sugar. A plant is being built at Riga to produce citric acid crystals.—Food Ind, N, 157, 140, 141

FAST MOVING AND BUILDING



PICK UP BUILDING—Two 80-ton cranes acting in unison, lift 100-ton building at Portland, Ore., and load it on barge for 2-mi. trip up Wilamette River to new location. To equalize load on all pickup points, cable slings were loosely clamped, then strain was taken in load lines and ties were made fast. —Cons Meth, N, 81



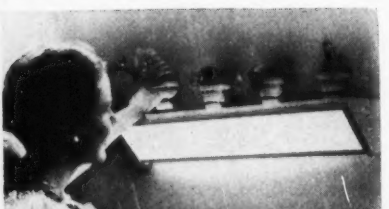
QUICK HOUSE MOVER—Used to clear right-of-way of a superhighway, new Tournamover straddles building up to 25 ft. wide, picks it up through needle beam under frame, and moves it to new location. Machine is powered by 214-hp. diesel tractor that drives generator for hoists, steering.—Cons Meth, N, 99

1 HOUSE A DAY—Using full-height plywood panels for both outside and partition walls, a contractor poured 48 all-concrete, one-story small homes in 48 days. The units are identical, except alternate houses are reversed in layout. By waterproofing and toughening the wood with Plastiglaze, low-grade plywood forms were used an average of 25 times. Each panel was bound at edges with light angle iron. After each use, forms were cleaned and oiled. A hoist tower served each pair of houses, with a mixer discharging direct into buggies on platform.—Cons Meth, N, 110

TINY ZINC DIE CASTINGS OFFER DESIGN ECONOMY

New design economies are offered by zinc alloy die castings weighing less than ½ oz. Mass produced on automatic machines as fast as 100 pieces per min. in a single cavity mold, they require few finish-machining operations and permit flexibility in design.

New production techniques, including redesigned die casting machines and unconventional casting dies, were developed for die casting the small parts of a modern slide fastener, or "zipper." Now the process is applied to many other small parts, including shanks for pearl buttons, umbrella rib tips, tiny buckles, buttons, screws, wing nuts, hollow end rivets, etc.



CONVENIENT FLUORESCENT—For lighting a kitchen sink, dining alcove, sewing room, study, powder room mirror, or similar places, a new portable fluorescent wall lamp lends itself to personalized decorative touches. It gives evenly distributed, glare-free light directly down on surface beneath and indirect illumination for entire area. It contains two 20-watt lamps shielded by a diffusing panel of frosted ribbed glass. The fixture, introduced by Sylvania Electric Products, Inc., can be hung on a wall and plugged into nearby outlet or installed directly to an outlet box.—Elec World, N 1, 29

Usually, a zinc alloy die casting can economically replace a brass screw machine part if the brass part has 50% or more scrap loss. In die casting, the finished part is made in one operation, and the raw material is used in ingot form without waste. No manual handling of the pieces is required.

A simple cup hook is an interesting example of cost reduction by die casting as one piece. This hook usually is made as a wire forming, and machine threaded. As a die casting, it is made in one piece and merely tumbled and plated. A bicycle wheel spoke nipple made as a wire forming required wire straightening, cold heading, drilling, tapping, straddle milling, and slotting. It is now die cast as one operation and requires only tapping.

The standard alloy consists of zinc, 4% aluminum, plus magnesium. A second alloy, used for added ductility, consists of zinc, 4% aluminum, magnesium, and 1% copper.—Prod Eng, N, 86

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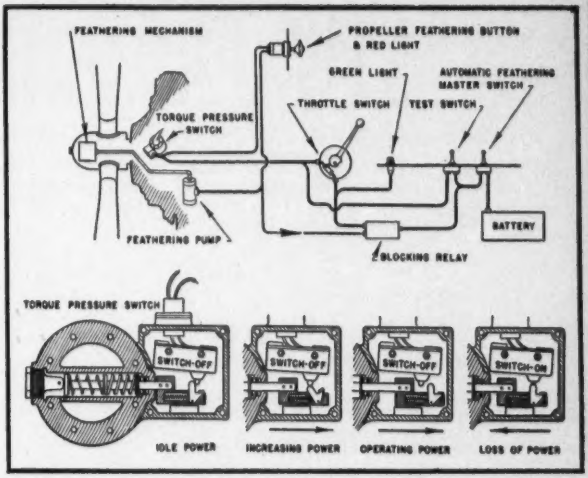
WHAT'S NEW IN MEDICINE

Tropocaine, a mixture of procaine and benzocaine in alcohol, can be painted on gums to deaden nerves during dentist's drilling. Not yet in commercial production, it has proved effective on three out of four patients during laboratory tests . . . Undulant fever, caused by *Brucella*, can be treated successfully in one week with sulfadiazine and natural whole blood or plasma, according to Michigan State College . . . Para-aminobenzoic acid, successful in combating typhus and Rocky Mountain spotted fever, has proved successful in treating animals infected with undulant fever at the University of Maryland.

Doctors at the University of Tennessee College of Medicine have tried penicillin in the eyes of 1,710 newborn babies in place of silver nitrate. It appears to be safer and less irritating to the infant's eyes.—Science Ill, D, 64

FEATHERS PROPELLERS — Rapid propeller feathering in case of engine failure during takeoff is assured by the Consolidated Vultee Aircraft automatic unit for twin-engine planes. Turning master switch readies system for operation. When throttle is advanced to 75%, a microswitch in throttle linkage closes and arms half of system; pressure switch on torque metering system arms the other half. Prop is feathered 1.5 sec. after power loss, delay avoiding feathering if motor backfires or misfires momentarily. — Aviation Wk, O 27, 32



SINKS BIG CAISSON IN MAN-MADE ISLAND

To ventilate the 1.7-mile Brooklyn-Battery twin vehicular tunnels, a big steel open caisson is being sunk 77 ft. to rock through a man-made island in upper New York Bay. The 51x111-ft. caisson has 6½-ft. concrete-filled walls and is divided into three compartments by 4-ft. cross walls. It will serve, along with an additional 63-ft. of rock shaft, as a ventilation shaft for the two tunnels.

The caisson was sunk by open dredge methods through 70 ft. of earth, and compressed air tools will enter it 7 ft. into rock. Sinking was aided by 56 jet nozzles set inside caisson cutting edge.—Cons Meth, N, 82

STRIPS DYED WOOL

Electrolytically prepared and regenerated titanous, chromous, or vanadous sulphate now can be used to strip most vat and chrome colors from wool. A solution of vanadium sulphate—vanadium pentoxide dissolved in dilute sulphuric acid—is poured into the cathode pot portion of the prepared cell. Dc. potential is imposed across electrodes, whereupon reduction occurs at the cathode, producing vanadous sulphate. This continues throughout the process.

Acid colors are stripped in 5-20 min.; chrome colors in 20-90 min.; indigo and vats in 60-90 min. Alizarin Black WR is the only dye that has not responded to the process. Hand of wool is not damaged, and stripped wool will take light color redyeing.—Textile World, N, 133

SILICONES ALTER MOTOR

Use of silicone resins for winding insulation and silicone grease for bearing lubrication make it practicable to build the 3- and 5-hp. 4-pole, totally enclosed, nonventilated motor on the same frames as those used for open motors. These motors have comparable torques and efficiencies, and power factors are only slightly lower. Although total loss is about the same, the new motors run much hotter than standard open motors. They are considerably smaller than the conventional enclosed motor.—Prod Eng, N, 134

NEW PRODUCTS

Hot-bearing Detector—A device capable of monitoring 24 bearings from each central control cabinet has been developed by Thomas A. Edison Inc. Electrical-resistance bulbs are located in direct contact with bearing metal. Temperature of each bearing is checked every 2 min., and an alarm sounds when there is overheating. An indicating lamp locates the hot bearing and the temperature can be read when desired. Automatic shut down is possible.—Am Mach, N 6, 174

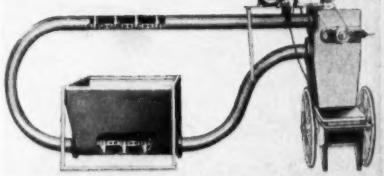
Pneumatic Timer—Unaffected by temperature or voltage conditions, an air-actuated timer provides a wide range of time-limit motor acceleration. Air is transferred from a lower to an upper chamber through an adjustable metering orifice. A return valve provides instantaneous reset. Timer may be directly coupled to contactor or actuated by separate magnet. Square D Co. developed it.—Power, N, 146

Multi-fuel Engine—Rated at 10.7 hp. at 300 rpm. and 21.4 hp. at 600 rpm., the new Lorain Type L, single-cylinder, horizontal, 2-cycle engine will operate on diesel fuel, natural gas, or butane. Condenser-type cooling system eliminates water pump; amount of make-up water is negligible. White-Roth Machine Corp. introduced the engine.—Cons Meth, N, 142

Labels While It Fills—Labels are affixed to bottles as bottles are filled in the new Biner & Siegrist "Fil-Labeler." Filling tubes and tank are stainless steel; hose is plastic; all moving parts are chrome plated. Machine fills 12 gal. per min.—Food Ind, N, 156

Bomber Blisters for Autos—Plastic bomber blisters are being transformed into transparent tops for convertible automobiles by Plexi-Tops. The Plexiglass blister is attached to body by five fasteners, remains cool in hottest sunlight, and weighs 50 lb.—Science Ill, D, 77

Eliminates Dust—New Paul E. McKamy & Assoc. wet-type dust collector has no moving parts. Washer contains one or more beds of ceramic packing material in scrubber and entrainment sections, number of beds depending upon use of collector. Packing rests on open grids to reduce pressure drop. Settling tanks are used to concentrate sludge.—Factory, O, 142



SEDIMENT CONVEYOR—Consisting of a motor-driven endless link chain with 4-in. Neoprene rubber flights 6-in. apart, a new transfer conveyor operates through a tube to move sediment from settling tank into disposal equipment. Conveyor rises sharply from tank to drain back fluid. Honan-Crane Corp. developed it—Power, N, 146

Increases Bobbin Capacity—A new shuttle, ¼ in. longer than standard and carrying a larger bobbin, has been developed by Steel Heddle Mfg. Co. Of processed wood, shuttle has shorter head and thinner walls. In 2 yr. of mill testing, the larger bobbins cut costs in filling preparation and required fewer battery hands, transfers, and bobbins.—Textile World, N, 166

Solenoid Selector Switch—Rotor of a new circuit selector switch is driven by solenoid on dc. current. The G. H. Leland, Inc., unit can be used in many appliances using selection of electrical control units, such as automobile radios.—Electronics, N, 216

Anti-fire Control—Sequence switch automatically sets direction valve to permit flow of CO_2 or other extinguishing agent to danger area in new Walter Kidde & Co. device for plane fire control. When guard lever is raised, solenoid is activated, closing electrical circuit to direction valve for specific fire area. Separate switch is used for each area.—Aviation Wk, O 27, 33

Sky-glow Lighting—An innovation in fluorescent lighting, Vinylite plastic louvers, with 60% transmission factor, are suspended under fluorescent lights to produce a luminous ceiling. Four sizes of louver sections permit geometric arrangements for various size ceilings. Benjamin Electric Mfg. Co. introduced the louvers.—Elec World, N 1, 29

Cold Maker—Temperatures down to −456°F. are possible with a Collins helium cryostat, developed by Arthur D. Little, Inc., liquified helium producing the near-absolute-zero temperatures. Cryostat and part of refrigeration equipment is housed in a cabinet; other necessary equipment includes a 10-hp. compressor and a low-pressure gas holder. Complete unit weighs 2,800 lb., occupies 50 sq. ft. —Business Wk, N 15, 74

New Silicone Oils—For use in high-temperature lubrication, the new DC710 silicone oil series has high heat stability, freedom from gumming, resistance to oxidation, water repellancy, low volatility, and high flash point. DC710R contains a corrosion inhibitor and provides permanent sealed-in lubrication. DC710G contains a colloidal graphite in suspension for machines exposed to extreme heat, weather, or humidity. Oils, developed by Dow Corning Corp., can be used between 10 and 500°F.—Prod Eng, N, 206

Thin Flexible Tubing—For high-temperature or pressure requirements, a new hose with either flat ribbon or round wire braid has a wall thickness of 0.005 to 0.015 in. Excessive vibration does not cause rupture. It is a Titeflex, Inc., development.—Aviation Wk, N 10, 37

Textile Inspecting Machine—Variable-speed drive on the new B. J. Phillips Co. textile inspection machine permits slow movement for cloth examination and fast movement for measuring. It accommodates 60-in. cloth on 64-in. rollers. Removable doubling attachment folds cloth for retail sale and may be reversed open folds.—Textile World, N, 164

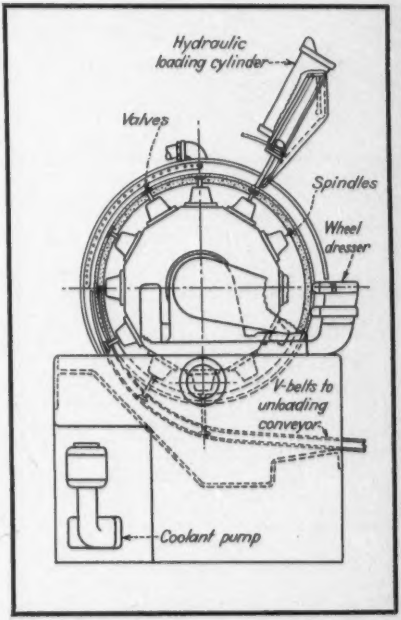
Koroseal Trolley Guard—New trolley guard for underground service is made of Koroseal, resistant to flame, acid, fumes, and mildew. Breakdown voltage exceeds 20,000 volts. Featured are tear strength and heavy edges, providing better hang and protection. It is a development of B. F. Goodrich Co.—Coal Age, N, 176

Rechargable Hand Lamp—Using a 6-volt, 20-amp.-hr. storage battery with built-in specific-gravity indicators, a new portable hand lamp casts a 2,500-ft. beam. Made by U-C Lite Manufacturing Co., it has a 6-in. reflector, heavy convex lens, and main and auxiliary bulbs.—Elec World, N 8, 152

Side-shift Lift Truck—To eliminate lift-truck maneuvering to position load exactly, Towmotor Corp. has developed the Side Shifter accessory. The carriage support can be moved 3½" in either direction easily.—Chem Eng, N, 166

Flexible Belt Grinder—Grinding and polishing of contours is possible with the flexible abrasive belt used in the new Porter-Cable Machine Co. belt grinder. Belt drapes into pattern on a shaped contact roll which operates as an idler. Roll is made of sisal and latex to hold pattern indefinitely.—Weld Eng, N, 96

Mills Cast Iron—Made in 6- to 14-in. sizes, the new Axial Face Kennamill is designed for production milling of cast iron and is suitable for light to medium cuts on solid or core castings. Kennametal, Inc., developed it.—Am Mach, N 20, 172

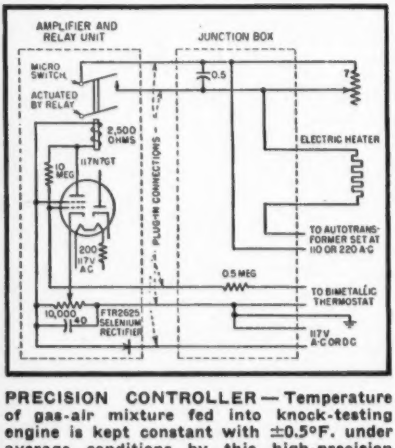


GRINDS 2,160 VALVES PER HR.—Loaded into the machine by hydraulic plunger, automotive engine valves are ground to size at rate of 2,160 an hour as they pass through a 90-deg. sector of the wheel face. Valves are released from collets by a cam and fall into a conveyor. Turret axis is set at an angle of 0 deg. 46 min. to wheel axis, and wheel is dressed at an angle that compliments the valve face angle. Wheel and turret rotate in opposite directions. Fitchburg Grinding Machine Corp. developed it—Prod Eng, N, 100

NEW PRODUCTS

New Type Tube Tester—Using a new method—the differential-frequency system—a new vacuum-tube tester provides proportional mutual conductance readings under conditions which closely resemble actual operation. "Good-Bad" readings also are provided by the Weston Electrical Instrument Corp. checker, and instrument will indicate static and regulating characteristics of voltage-regulator tubes and will test thyratrons. —Elec World, N 8, 140

Slip-proof Tile—Inert filler materials are bonded by a heat-resisting thermosetting resin, and an aluminum oxide abrasive is incorporated to make a new, long-wearing safety tile. Oil and moisture resistant, the tile weighs 2½ lb. per sq. ft., is made by American Abrasive Metals Co.—Power, N, 134



PRECISION CONTROLLER — Temperature of gas-air mixture fed into knock-testing engine is kept constant with ±0.5°F. under average conditions by this high-precision electronic control setup. When temperature is low, contacts of bimetal thermostat are open, and flow of plate current in vacuum tube operates relay to close Micro Switch and permit high-heat current to flow in heating element in engine intake. When temperature rises, thermostat contacts close, grounding grid of tube, reducing plate current to nearly zero. This opens Micro Switch and cuts in resistor to reduce heater current. Contacts can operate as often as once per intake stroke. Similar relay units will hold water baths within 0.0001°C.; air baths, 0.001°C.—Electronics, N, 99

High-temperature Insulant—Specially processed glass filaments now are available in lightweight felt and bulk forms for insulating against temperature up to 1800°F. This development of Owens-Corning Fiberglas Corp. provides a removable and replaceable insulation that can take the place of refractories.—Chem Eng, N, 158

Plastic Wall Covering—Lifewall, a vinyl resin covering on a cellulose base, can be used to cover wall surfaces without use of metal molding. Flexible enough to fit angles, it is fastened with special cement. It can be cleaned with a damp cloth. The Pantasote Co. development is available in 17 colors, in plain and dull finishes. It comes in 50-in. wide rolls.—Business Wk, O 25, 61

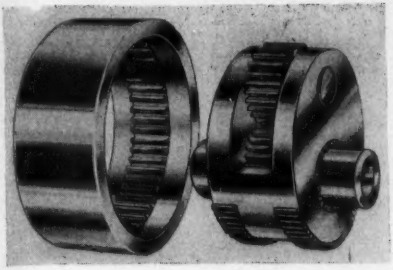
Diesel-electric Crane—Electric power moves the new "dieselectric" crane along tracks, and low-cost diesel power operates the turntable and load-lifting mechanism. Crane uses grab bucket, grapple, or magnet for load lifting and can be used for car switching. Each truck is a self-contained power unit. Crane is a development of American Hoist & Derrick Co.—Coal Age, N, 178

Rubber-cushioned Pump—Rotors in the new Paul Engineering Co. positive-displacement pump move against flexible synthetic rubber cushions, without danger of damage by sand, grit, or other abrasives. There is little friction loss. Rubber is not effected by oil, kerosene, or gasoline.—Prod Eng, N, 194

Portable Crusher—Specially applicable to contractor type service, a new portable crushing unit consists of a 22-in. Symons cone crusher, motor, and drive, mounted on welded steel supporting base and skid. Capacity of the Nordberg Mfg. Co. unit varies from 20 tons per hr. at ⅜-in. setting to 60 tons at 1½-in. Electric, diesel, or gasoline drives are available.—Cons Meth, N, 142

Speeds Quality Control—Calibrated to individual inspection standards, the new pocket-sized Lightning Calculator Co. quality-control calculator speeds up inspection operations. Operator moves dial to indicate number of rejections from the number of units checked. Arrow indicates whether more samples should be checked, or whether entire batch should be accepted or rejected.—Business Wk, N 1, 61

Vise Holds Odd Shapes—Four tool-steel fingers hold odd shapes, without use of special setups, in new Bench-King vise of Benj. Uydess & Sons, Inc. Fingers set into receptacles in solid bronze jaws and are shiftable. Thicknesses of 0.001 to 2½ in. can be held. —Am Mach, N 6, 168



EPICYCLE DRIVE—Providing simple and efficient means of converting high rotational speeds to slow reciprocating motion, the American Brake Shoe Co. epicycle drive is built as an integral part of antifriction or plain bearing. Design permits flexibility in both speed and stroke, making possible use of built-in or direct-drive input power. If synchronous speeds are not required, rolling members can be substituted for gears.—Prod Eng, N, 204

Glass Sand—Small, glass globules popped by extreme heat from perlite ore are used to replace sand in plaster. It weighs only 12 lb. per cu. ft. Plaster resists checking and cracking and offers some insulation against heat, cold, and noise. Glass-sand is a development of Dant & Russell.—Eng News-Rec, N 13, 162

Draws Curves Simply—It is possible to produce almost any curved line desired with the new Infinarc. Curves are produced by inserting ends of specially tempered wire forms in slots of a foot-long base. Curve of wire is changed by moving either or both of the slots along base. Four curved wires are provided. It is a Cook Speciality Co. development.—Aviation Wk, N 3, 33

Motored "Hand Truck"—Capable of speeds up to 5 mph., the new Comet Mfg. Co. two-wheel "hand truck" is powered by a 1½-hp. engine. The rubber-tired, demountable wheels are driven through a chain drive and a centrifugal clutch. Truck will carry a 1,500 lb. load up a 20% grade. One model has a third wheel to support handles.—Business Wk, N 22, 66

Precision "Inching"—To cause motion of an electric motor in small increments, as for "inching" machine tools, the Pulsing Drive applies a series of short electrical impulses to the winding. Length of time increment during which motor turns is dependent on speed of rotation of control knob on the device of Yardeny Labs.—Am Mach, O 9, 176

Slip-proof Belting—Designed for use with special pulleys grooved to fit belting teeth, the new U. S. Rubber Co. nonslip rubber machine belting with teeth gives positive engagement at pulley speeds of 10,000 fpm. Steel cables in belting minimize stretch.—Business Wk, N 15, 22

Skin Adhesive—Surgical dressings can be attached directly to the skin by using a new liquid plastic skin adhesive. Adhesive is impermeable to water, oil, soap, weak acid, or alkali. Isopropyl alcohol is used to remove it. It is a Clay-Adams Co., Inc., development.—Pharm Int, D, 47

Combination Luminaire—Fluorescent and incandescent lamps are combined in the new Circle-Plus kitchen luminaire of Mitchell Manufacturing Co. The unit comprises a 100-watt filament bulb shielded by a cylindrical white ceramic-glass bowl which is encircled by a 32-watt circular fluorescent tube. Incandescent bulb lights room instantly, the fluorescent coming on a few seconds later.—Elec C & M, N, 115

Plastic-lined Pipe—Pressure strength of steel pipe is combined with extreme resistance to a wide variety of chemicals, oils, and solvents in the new Saran-lined pipe and fittings of Dow Chemical Co. The pipe is said to be satisfactory for sulphuric, hydrochloric, nitric, and phosphoric acids. Working temperature ranges from zero to 190°F.—Chem Eng, N, 155

Uphill Monorail Tractor — Comparatively heavy loads are carried up inclined monorail conveyors by the relatively lightweight electric monorail tractor introduced by Detroit Hoist & Machine Co. The tractor effects a "biting action" on the rail.—Am Mach, N 6, 172

New Bug Killer—Both a stomach poison and a contact insecticide, Synklor is four times as powerful as DDT, lasts 90 days on inside surfaces. Effective against roaches, moths, and other household pests, it is no more toxic than DDT. U. S. Rubber Co. developed it.—Science Ill, N, 77

FREE SERVICE TO READERS

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Makes Wool Shrink-Resistant

New Alrose Chemical Co. processes use wet chlorination in both acid and alkaline systems. Standard machinery employed in both processes

Wool is stabilized by new acid and alkaline wet chlorine processes, called Protonizing, developed by Alrose Chemical Co. The alkaline process imparts extremely soft hand, excellent strength and abrasion resistance, and level dyeing properties to the wool at low cost. The acid process produces a very white wool, but it requires more chlorine and is more costly. Both processes are in commercial use, being applied just prior to dyeing. The process makes it possible to knit varicolored materials directly from shrink-resistant yarns.

Soda bleach is obtained by bubbling chlorine into a cold caustic soda solution. Calcium hypochlorite also is used as a source of chlorine for making wool resistant to felting. Rapidity with which chlorine is released can be controlled by regulation of pH of bath, temperature, concentration, and rate of addition.

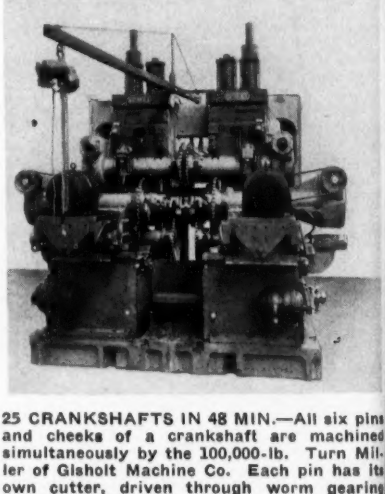
Acid Process—Acid chlorination without yellowing has been obtained by adding certain sodium chlor-sulphamates to the acid solution. Addition of some formaldehyde to bath helps to maintain satisfactory hand and strength. Amount of chlorine depends upon type and grade of wool, yarn, and fabric construction. For coarse wool material, 3% chlorine by weight is adequate; for fine, high-quality material, 4% may be used. For all wools the amount of chlorine should be determined by laboratory test.

Wool is treated in form of tops, yarn in packages or skeins, knitted piece goods, hosiery, etc. The process does not affect other types of fiber in material.

Wool is first scoured, then rinsed in hot and cold water. Sodium sulphamate solution is mixed with 5 times the volume of cold water, and sodium hypochlorite is added and allowed to stand for 10 min. Wool enters machine while formaldehyde and wetting agent are added. Machine is run for 10-15 min. and temperature is raised to 110-120°F. In 30-45 min., exhaustion is 95-98%. Goods are neutralized with 2-5 lb. of sodium bicarbonate at 90-120°F. until pH of 7 or 8 is reached, then it is rinsed in warm water.

Treated wool is whiter than original wool and may be bleached further or dyed without using special techniques.

Alkaline Process—No buffer is used to control chlorine exhaustion, the process being regulated by slow addition of hypo-



25 CRANKSHAFTS IN 48 MIN.—All six pins and cheeks of a crankshaft are machined simultaneously by the 100,000-lb. Turn Miller of Gisholt Machine Co. Each pin has its own cutter, driven through worm gearing by an individual 25-hp. motor. Four cutters move only in vertical plane; two move horizontally and also sidewise to facilitate loading. A pair of master cams on work spindles hydraulically control movement of the six 24-in-dia. cutters. Slides follow crankpins as crankshaft is rotated. Two adjustable worm gears diametrically opposite and connected by a gear train eliminate backlash from headstock drive.—Prod Eng, O, 98

chlorite to bath and by keeping temperature low. Alrochlor S is used to pretreat wool. The amount of active chlorine is based on weight of wool to be treated—2-3% for high quality, 1½-2% for coarser wools.

Wool is scoured, then rinsed. To fresh bath, 2 oz. of nonionic wetting agent is added along with 15 lb. of pretreatment solution. Machine is run for 30 min., at temperature between 70 and 80°F. Batch is then given two 5-min. cold rinses, the water containing 6-7 lb. of bicarbonate of soda. Then wetting agent and sufficient ice to keep temperature at 60-70°F. is added. The hypochlorite is added slowly over a 10-min. period, then rinsed again.

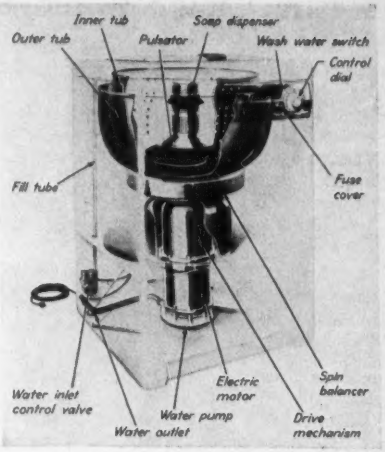
Batch is reinserted in machine and 5 lb. of sodium sulphite and 4 lb. of sulphuric acid are added to bath. Machine is run for 10 min. at 80-90°F. and batch is dropped. Neutralization is with a bath including 5 lb. of bicarbonate of soda.

Wool is light tan in color and usually is dyed without further bleaching. For whiter shades, wool is given a 2-hr. bleach with 1-volume hydrogen peroxide at 140°F.—Textile World, N, 151

WASHER HAS PULSATOR AND SPIN BALANCER

Reciprocating 5 times per sec., a conical plunger gives a pulsating action to the water in Frigidaire's new automatic home washer. Rotating parts are dynamically balanced so machine need not be bolted to floor. One setting of a single control dial times the less-than-30-min. cycle of washing, two rinsings, spinning to damp-dry, and cleaning the machine. Adjustable legs level machine. Water is metered into tub at 4-gpm. rate by a thick rubber orifice which flexes under high pressure to reduce size of opening and hold flow constant.

Reciprocation of the pulsator is effected by a gear-driven vertical crankshaft with an inclined "throw" on the end. A spindle on this throw tilts back and forth as the shaft rotates, and it raises and lowers the plunger. Pulsation is stopped during dry spinning. The spin balancer consists of a flywheel connected to its hub by spiral steel springs. When unbalance occurs in the washer, the flywheel is displaced to counteract the condition. A turbine-type pump bolted to bottom motor flange has no screen, filters, or valves and revolves at motor speed.—Prod Eng, N, 96



Phantom view of washer, showing parts.

SULPHUR KILLS BLIGHTS

Colloidal sulphur or gas sulphur paste, developed by the Russian Institute for Fertilizers and Insectofungicides, has been found effective against blights and pests. Colloidal sulphur is obtained from coke-oven and producer gas, stripped of its hydrogen sulphide by the arsenic-soda method. All admixtures which might burn blooms or plants are washed out. Sulphur is made soluble in water by a 1% solution of sulphite cellulose extract added in final sulphur wash.

It is prepared either as a paste with 50% moisture, or as a powder with 15-25% moisture.—Food Ind, N, 141

SORBITOL FROM CORN SUGAR BY CATALYTIC REDUCTION

Reaction of corn sugar with hydrogen to form sorbitol is accomplished in minutes by the new high-pressure catalytic process of Atlas Powder Co. Electrolytic reduction requires many hours. Sorbitol is a hexahydric alcohol with many characteristics similar to those of ethylene glycol, glycerine, and other polyhydric alcohols.

The new process involves: (1) Preparation of feed slurry by dissolving corn sugar in water and mixing with nickel-clay catalyst. (2) Continuous, high-pressure catalytic hydrogenation in a special reactor. (3) Separation of spent catalyst from sorbitol solution by filtration, the catalyst being reprocessed and reused. (4) Purification of sorbitol by deionization, followed by decolorization with activated carbon. (5) Evaporation in a single-effect unit, followed by weighed addition of water to adjust final concentration.—Chem Eng, N, 114

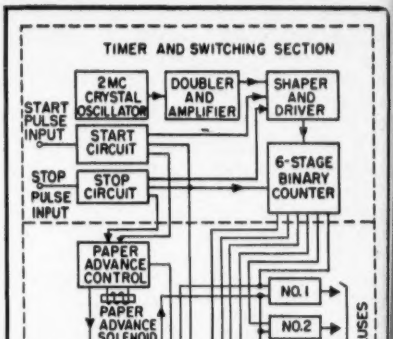
ELECTRIC ASPHALT HEATER

A new 160-ton asphalt plant in Los Angeles, Calif., is being heated electrically. Asphalt and road oil are maintained at 325°F., the installation consisting of a 226-kva. system. Two reinforced concrete tanks, 35x13x10 ft., have a 110-ton capacity. Each tank has six 80-ft. resistance heating units of 2x¾-in. mild steel bars, mounted 4-in. above floor. Units are paralleled through copper bus bar at the terminals of 75-kva., single-phase, 480/25-volt transformer. Each bar is rated 12 kw. at 25 volts.—Elec West, O, 86

ANALYZES ALLOYS QUICKLY

Electronic analyzers, called Quantometers (McG-H Digest, May, '46, p. 46), have been installed at Aluminum Co. of America, Permanent Metals Co., and National Smelting Co. Alloys containing up to 12 elements can be analyzed at one time, and the unit can check up to 7 different elements. Electronic tube "look" at spectrum lines for 20 sec., com paring width of lines with known width of lines for various elements, thus dete mining alloy content. On repetitiv analysis jobs, machine turns out thre readings per minute.

A refiner operating 12 furnaces on 24-hr. basis can increase, through use the Quantometer, output equivalent that of one furnace.—Business Wk, 18, 66



NUCLEONICS TIMER—Designed to meet needs of nucleonic research, this interval timer measures and records intervals up to 16 microsec. with 0.25 microsec. accuracy. Intervals to be measured may occur at random and be widely separated. Basic element is a binary scaler or counter chain connected through a gating circuit to a 4-mc. driving source. Pulses marking interval to be measured are applied to a gate or switching circuit which passes a representative block of high-frequency cycles to the binary chain where they are counted and registered. Result is automatically recorded as dot pattern by six styluses.—Electronics, N, 126

CENTRAL COOLANT FILTER CUTS COSTS AT FORD

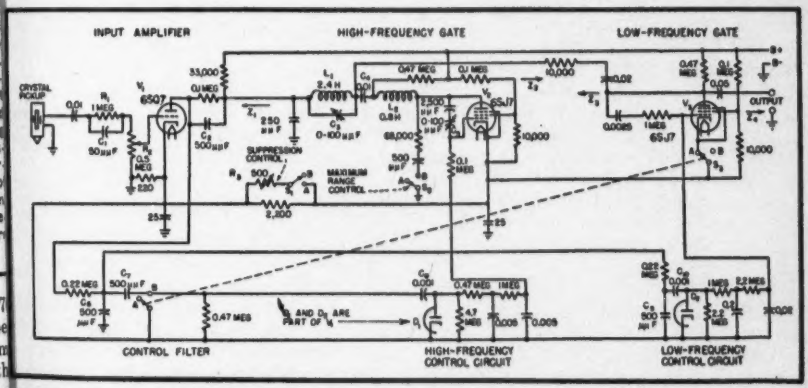
By substituting centralized filtration of coolant for filter bags at each of 113 piston grinders, Ford Motor Co. has saved 96.5% in the cost of filtering operation. In addition: (1) Better finish is attained on aluminum pistons, as no stray chips are present in coolant. (2) Grinder wheel wear is reduced, with savings in redressing and down-time. (3) Plant is cleaner. (4) Disagreeable filter maintenance and cleaning jobs are eliminated.

Dirty soda water from grinders flows down a covered trench to a pit, then through a vertical baffle to a pump which forces it into screen-type filters at 15-20 psi. Fluid in dirty water tank is agitated to avoid chip clogging, and flow is directed so that chips enter a plug and chain-type sludge conveyor which discharges to a dump cart.

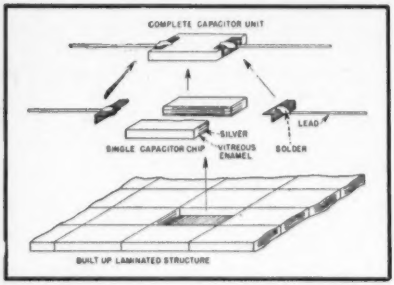
Three filters are aligned in a battery, two always being on a line, while the other is blown down with 100 psi. air. Blowdown is every 60 sec., for 9 sec. Automatic timers control blowdown sequence.—Am Mach, N 16, 126

STRIPPER SELLS TOP SOIL

Part of the cost of removing overburden from its strip-mining operations will be defrayed by Rothey Bros., Inc., by scalping and storing the top 4-5 ft. of floodborne top soil for future sale. Top soil lies over 15-20 ft. of additional overburden. Stripping operation is in an area flooded once or twice a year by nearby stream. Previous operations in the area failed because of danger to heavy equipment during flood time. Now all equipment is light, easily removed when flood stage is reached. A raft carries pumping equipment to drain pit when flooded. —Coal Age, O, 88



IMPROVES RECORDED MUSIC—Essentially noise-free reproduction from phonograph records and broadcast transcriptions is attained with the widely used effective new dynamic band-pass system for separating signals from noise. And the maximum frequency range of the recording is utilized. Signal-controlled reactance tubes act as gates that move the ends of the audio response curve inward and outward continuously and independently to let only the desired modulation through. Fundamentals of desired high-frequency notes are filtered out and rectified by a control circuit to change bias and hence capacitance in high-frequency gate. Harmonics of desired low-frequency notes simularly vary inductance in low-frequency gate. Shown above is circuit of a two-tube dynamic noise suppressor as incorporated in a home phonograph, with amplifier stage for coupling crystal pickup to suppressor circuit.—Electronics, D, 96



Laminated ceramic-silver structure made by build-up process is cut into capacitors of desired size.

CERAMIC CAPACITORS BUILT-UP IN LAYERS

Capacitors having electrical characteristics comparable to those of high-quality mica units are produced by a sprayed-enamel, printed-silver process. Multiple capacitors, printed, circuits, and high-voltage connectors also are made by this technique. Desired structure is built up on 9x12-in. steel conveyor plates precoated with dilute solution of ethyl cellulose in methanol. Enamel is sprayed on, dried to "cheesy" consistency by infrared lamps, then desired silver paste pattern is deposited on plate by silk screen or squeegee printing; pattern may contain many units. Next operation is spraying on enamel, and the spray-dry-silver cycle is repeated until desired number of laminations has been formed. Built-up structure is cut into units and baked. Any desired connections between layers of exposed silver may be made with silver paste. Unit is then fired 12 hr., leads are attached, and finish applied.

The build-up process is mechanized, a rectangular conveyor carrying the plates through one operation after another. The technique is easily extended to include a number of capacitors or a combination of capacitors, resistors, and inductors in one unit.

The silver paste is about 60% du Pont V-9 silver flake in an organic vehicle. The dielectric enamel consists of 15-25 mole percent of silica, 3-11 of alkali fluorides, 15-25 of lead oxide, and 11-30 of other bivalent metal oxides.—Electronics, D, 106

INCANDESCENT CARBON BRAZES COPPER QUICKLY

Incandescent carbon brazing is faster than either oxyacetylene-torch or carbon-arc methods and is of advantage where joints must be made adjacent to electrical insulation without charring it. Carbon blocks hold the parts in intimate contact during heating and cooling and supply heat to the parts to melt the brazing material. Heat is developed in the carbon because of its resistance to high-amperage, low-voltage current.

Principal application is joining flat copper parts, such as used for current-carrying members. Ideal joint is two copper conductors overlapped by 3 times thickness of thinner piece. Most joints can be resolved to a modification of this. In brazing cables to flat terminals, cleaned strands are placed in a thin-wall tube or ferrule, then partial flattening permits good contact for the carbons.—Am Mach, N 6, 98

EFFICIENT MERCURY CELL

Requiring only 60% as much floor space as horizontal cells, and less expensive to operate than European vertical cells, a new mercury cell for producing caustic soda and chlorine has been developed by Mathieson Alkali Works. The cell is stationary, rather than of the rocking type. It has various special features, such as a flexible connection which permits shifting of the anode without interrupting current flow. The design of the decomposing tower, filled with graphite packing, provides a very short anode-to-anode distance for high efficiency. Licenses are available to companies outside the United States.—Chem Eng, N, 108

The first postwar transport designed for short-haul airlines, the Martin 2-0-2.

Plane for a Purpose—the 2-0-2

High speed, fast takeoff, short landing, low-cost operation, ease in maintenance make the Martin 2-0-2 ideal for short-haul airlines

Put into service between Chicago, the Twin Cities, and Winnepeg in October, the Martin 2-0-2 is the first postwar transport to go into commercial operation. This advanced 2-engine cargo-passenger transport (McG-H Digest, May '47, p. 29) gives passengers the speed, safety, and comfort they desire, and should give operators the low-cost operation they need to earn a profit. The plane was constructed to conform to, or excel, the ideal design formula of Air Transport Association of America. As such, it is a model for future planes of its type.

Outstanding design and performance data are described below:

Flying—Featuring speed, the plane cruises at 282 mph. at 10,000 ft. using 70% power. Contributing to this speed are the power plant and wing design. Power plants carry only 9.4 lb. per hp., less than the *Constellation*. At sea level, with maximum landing weight, it will clear a 50-ft. obstacle and stop in 2,280 ft. It has stopped well short of this when using braking power of reversible-pitch propellers.

The wing area is smaller (864 sq. ft.) than that of previous 2-engine transports, calling for long, double-slotted flaps with a vane for increased landing drag. Prepositioned flap control is semiautomatic, hydraulically operated.

Different shaped knobs are used on the pedestal controls between pilot and copilot for ease in feel-recognition.

Safety—Safety features are numerous. Electronic smoke detectors, located in all hazard areas, flash warning to the pilot. Pilot discharges CO_2 from cockpit control panel to affected area. Propellers are feathered automatically in event of engine failure.

To reduce danger of gasoline fire during emergency landings, Martin developed a new puncture-resistant wing tank. Of synthetic rubber, it has four interconnecting cells and weighs 0.11 lb. per gal. of fuel. In emergencies, using both forward door and tail ramp, plane can be emptied in 28 sec. Cockpit windows are double-paned and are self-defogging.

Thermal deicing system is extended to include the leading edges of the propellers as well as the leading edges of wing and tail assemblies.

Maintenance — Interchangeable engines can be replaced in 40 min. Speed is possible through use of 3-point tubular engine-mounting, all control lines disconnecting at fire wall. Hinged access doors below nacelles permit mainte-

nance of oil pressure, fuel, and fuel mixing systems from ground; underfuselage doors give access to electric, hydraulic, and cabin-heater systems. All doors are equipped with small flood lights. Panel between wheel well and nacelles gives access to engine accessories; instrument panel is reached through a door in nose wheel well.

Both high (3,000-psi) and low (1,500-psi.) hydraulic systems are used, the former operating the flaps and landing gear, the latter the brake valves, windshield wipers, and steering.

Cargo—Main cargo cabin has 2,240 cu. ft. capacity and is 47 ft. long. It is reached through a 96 x 72-in. door on the left, aft of wing, and a forward door 68 x 26 in. Tail ramp is too small for bulky cargo and adds an unnecessary 140 lb. to a purely cargo ship.—Air Trans, N, 19

CLOSE CONTROL GIVES LOW-COST INVENTORY

Inventory turnover rate at Monarch Machine Tool Co. is 3.6 annually against an average of 2.4 for seven other large machine tool manufacturers because of careful planning and control of supplies on hand. Inventory is held at the lowest possible point to assure smooth production, the supply of finished and semi-finished parts never exceeding requirements for confirmed orders.

Actual needs are based on sales backlogs, totaled at the end of each month. A cross-usage index lists the quantity of parts required for each tool model. Total parts needed are determined by multiplying the number of machines that have been sold by the quantity of parts needed for each machine. Totals are added. From this is deducted the balance in stock plus the quantity issued to assembly for machines not yet shipped. Parts to be ordered are studied to determine economical ordering quantities. Control cards list parts by parts number. As material is received in the stock room, quantity and date are entered on top half of the card. Receipts are entered in red and added to stock on hand figures on lower half. Stock issues are subtracted as they are made.—Factory, N, 103

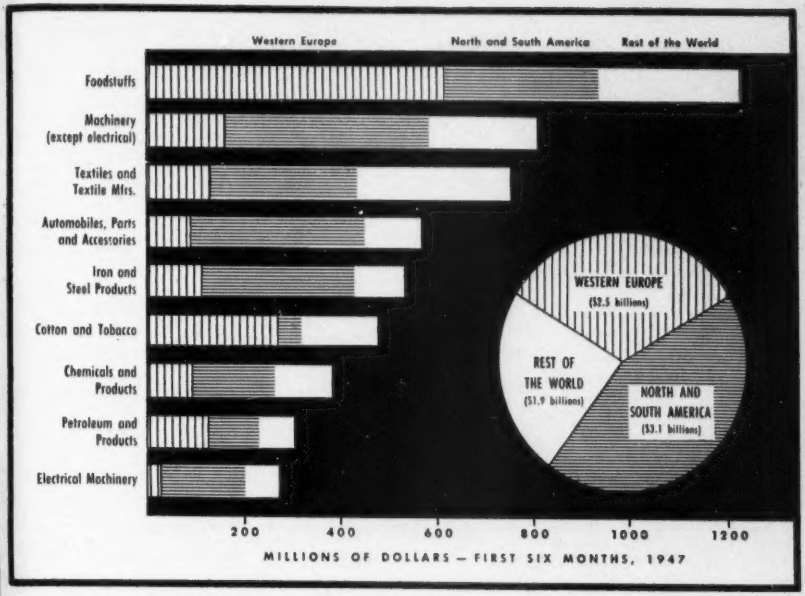
ENGINEERING STANDARDS SYSTEM SAVES TIME

Much duplication of work is avoided and efficiency of engineering design departments is promoted by the use of drawing standards, prescribed methods of computation, and standard parts at Caterpillar Tractor Co. Manufacturing and processing time is saved by material and heat-treatment standards, ordered routine in fabrication, and the use of standard parts. The standards section consists of an engineer and six assistants.

All parts used repeatedly in the design of new products, or the revision of old ones, are listed in the "Standard Parts" volume, preferred parts being in heavy black print. The point of origin for all information appearing in this volume is the design checker's desk.

Two other standard volumes are maintained—"Engineering Standards" and "Material and Heat Treatment Standards." Point of origin for new or revised standards for these volumes may be the engineering, metallurgical, manufacturing, or research department.

Design calculation sheets are a feature of the "Engineering Standards," which covers engineering and design data and practices and forms for calculation. These sheets are available from stock and routine calculations are always made on them. Constants and other standard data are stated so that no reference materials are required. Filled-in calculation sheets accompany a drawing for the checker's use, then they are filed and cross-indexed. Gears, for example, are cross-indexed for part number, pitch, and number of teeth. New gears having the same pitch and number of teeth need not be recalculated.—Prod Eng, N, 81



Record exports indicative of U. S. capacity to meet Marshall Plan requirements.

WHAT MARSHALL PLAN MEANS TO WORLD BUSINESS

Report to Management

WORLD TRADE can be expected to reach new peaks in 1948. The Marshall Plan is certain to provide urgently needed financial aid on a large scale. Tariff concessions negotiated by the International Trade Organization at Geneva will boost U. S. imports as fast as additional supplies of goods and commodities are available. All signs indicate high-level business activity in U. S.

Of these three factors, the Marshall Plan will hold the limelight during the next few months. Details of its effects on world business are discussed in the following digest of a report made by the McGraw-Hill Economics Staff and published in McGraw-Hill publications. Not included, because plans are still under negotiation in Washington, are detailed plans for extending the Marshall Plan type of aid to other areas.

Assisted by world tariff concessions and high-level business activity in U. S., the Marshall Plan will push world trade to new peaks, while enabling Western Europe to recover. It and similar plans will help the business of the entire world importantly and will make significant changes in world trade.

China, for example, has so far been

WHAT WESTERN EUROPE WANTS

(Figures represent total imports, in millions of dollars.)

Products and Equipment That Are Needed	European Committee Estimate for 1948	Estimate for 1948 as Revised	European Committee Estimate – for 1948 Through 1951
Food, Feed, and Fertilizer	1,500	1,270	5,400
Cotton	350	350	2,000
Coal	340	370	700
Iron and Steel Products	370	230	1,200
Petroleum Products	510	485	2,200
Chemicals	250	200	850
Timber	100	95	400
Farm Machinery	370	100	1,100
Inland Transport Equipment	200	60	490
Petroleum Equipment	170	130	555
Mining Machinery	80	80	220
Electrical Equipment	150	125	500
Machine Tools and other Machinery	545	450	1,750
Miscellaneous	1,065	1,065	3,030
Total	6,000	5,010	20,395

granted only $20,000,000 a month to cover dire emergencies. But in Washington, insiders are confident that some plan which is far broader and more constructive is under consideration. Probably it will be revealed as a part of a vast Far Eastern rehabilitation program and announced in conjunction with the Japanese peace treaty during the spring. At least $1 billion is likely to be made available to help put business in the Orient on its feet.

Latin America will benefit directly from the Marshall Plan, in addition to supplemental aid which may be announced later to help industries.

The Harriman report advocates that $2 billion be made available in 1948 by the Export-Import Bank for the purchase of goods and commodities from the other Americas for delivery to Western Europe. More than one-half of this amount is likely to be spent in Latin America, mainly for food and petroleum products. Over the 4 years of Marshall Plan buying, the U. S. may advance as much as $5 billion for this.—THE EDITORS

MARSHALL PLAN ANALYSIS

WESTERN EUROPE possesses the skills and resources necessary to work out its economic salvation. The fact that in two years it has not done so reflects both the depth of the wounds it suffered in war and the unexpected difficulties it has encountered since then. With time, these skills and resources can be made to reassert themselves. Meanwhile, food, equipment, and materials from America will shorten the job and enable Western Europe to stay on its feet.

It is the purpose of the Marshall Program to provide the things needed so that Western Europe may complete its economic recovery and retain its political independence in the face of aggressive Communism.

Secretary Marshall gave the program that bears his name the initial push, but Western Europe quickly seized the initiative.

A committee of 16 nations surveyed their needs and resources. From this

WHAT UNITED STATES CAN SUPPLY

Coal—Requirements likely to be met, but some lower grades of coking and byproduct coal may have to be taken by Europe.
Steel—Shipments of semifinished items will be far below request, but more finished steel may be supplied. Scrap not available.
Petroleum—Demands not likely to be met in full in 1948, but situation may ease in 1949. Oil now is in tight supply in U. S.
Chemicals, Fertilizer—Nitrogen is short, but more may be shipped. Phosphates will be provided; 80,000 to 85,000 tons.
Coal Equipment—Order backlogs are likely to cause difficulties.
Petroleum Equipment—Situation is like that for coal equipment.
Freight Cars—Shipment of 20,000 cars this year is recommended.
Electrical Equipment—U. S. producers of heavy apparatus will not be in position to help for several years, but shipbuilders may.
Farm Equipment—Shipments in 1948 may not exceed $100 million.
Machine Tools—These requirements can be met without difficulty.
Other Equipment—Cranes and shovels very tight. Steam engines, canning machinery, and milling machines can be supplied.
Food—Shipments may equal last year, with shifts as to products.

grew a broad program designed to achieve a balance between the economies of Western Europe and the rest of the world by 1952. Moreover, the program seeks such a balance while raising the standard of living close to that of prewar days. Hunger and disorder which force extreme social change may thus be eliminated.

While Western Europe's economic program is not yet a detailed plan, four fields are staked out for action. One involves an immense effort on the part of the cooperating nations to raise their own capacity and output. A second requires the establishment of internal financial stability in countries like France and Italy that now lack it. A third looks forward to closer economic cooperation between participating countries on a more permanent basis. Finally, a fourth lays out the extent and nature of the aid which Western Europe will require from the United States and from the remainder of the countries which make up the Western Hemisphere.

What Western Europe Needs

To get back on its feet economically and develop a sound long-range program, Western Europe has said that it needs more than $20.5 billion of goods and services from the United States over a 4-yr. period. In return it would offer goods and services to the extent of $4.7 billion, leaving a $16 billion deficit. The heaviest demand would be in 1948 ($6 billion), then requirements would drop to about $4.1 billion in 1951.

Canada and Latin America are asked to aid Europe to the extent of carrying a trade deficit amounting to almost $6 billion for the four years. How far the U. S. will finance Western Europe's deficit with Canada and the other Americas will be one of the controversial issues which the U. S. Congress must settle. Such financing, of course, would provide these countries with more dollars for use in world trade.

The accompanying list of items that Europe wants from the United States is

WHAT CANADA AND LATIN AMERICA MIGHT SUPPLY

(Millions of dollars—Estimates by McGraw-Hill)

	April–June 1948	Fiscal year 48–49	Fiscal year 49–50	Fiscal year 50–51	Fiscal year 51–52	Total Four Fiscal Years and April-June '48
Bread Grains	160	730	760	770	770	3190
Coarse Grains	80	460	590	630	630	2390
Oils & Fats	50	220	240	260	260	1030
Sugar	40	190	190	200	200	820
Meat	80	320	320	330	330	1380
Dairy Products	10	40	40	40	40	170
Eggs	10	40	40	30	40	160
Tobacco	10	20	20	20	20	90
Coffee	40	190	180	190	180	780
Cotton	40	180	180	180	180	760
Nitrogen	—	20	20	10	10	[60
Agricul. Machinery	10	20	20	20	30	100
Timber	40	170	170	150	130	660
Iron & Steel	5	20	20	20	20	85
Trucks	1	5	10	10	10	36
Total	576	2625	2800	2860	2850	11,711

somewhat general, and it has been pared down chiefly on the grounds that the supplies are not available. Among agricultural supplies, bread-grains and foodstuffs are the big items. Dairy products and fats also are sizable. Of the $2 billion or more of petroleum products, three-fourths are refined and one-fourth crude. Coal shipments will bulk large the first year (45 million tons), but will fall rapidly thereafter. The steel request originally included 1.5 million tons of scrap in 1948 and more thereafter. This isn't available. Of the finished items, sheet and tin plate come to 744,000 tons in 1948, the peak year. The chemicals wanted are industrial chemicals, paints, and medicinals, as well as a lot of unnamed specialities. The huge catch-all labeled miscellaneous covers textiles and whatever additional consumer manufactures Europe will seek. Aircraft and surplus ships are other important items in the group.

A number of items on the equipment list could cause trouble. Farm machinery, mine equipment, refining equipment, and electrical apparatus are among these. Some $400 million of steel equipment is wanted for continuous sheet and strip mills in Britain and France. Part of this already is on order with deliveries assured.

What the U. S. Can Supply

Under the Marshall program, U. S. exports to Europe will be about $6 billion and total exports $16 billion in 1948. The sale of services—shipping, tourist, and the like—will add another $2.5 billion. This overall sum of $18.5 billion probably will run about $10 or $11 billion greater than United States imports.

Under the Marshall program, then, the foreign trade of the United States will be close to the peak that prevailed in the second quarter of 1947. But the overall inflationary impact of exports in 1948 is certain to be less than it was in that 1947 peak period. Not only is the U. S. capacity to produce growing but certain elements in the domestic demand are a

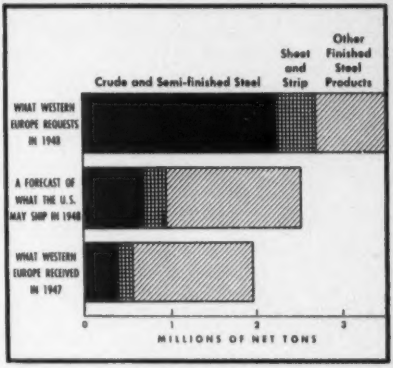
most sure to be less strong. This does not mean, however, that the program can be handled without difficulty. Many of the items Western Europe needs most are those which normally would continue in tight supply. These bottlenecks will be discussed product by product.

Coal—Western Europe wants 45 million tons of coal from the U. S. in 1948. Thereafter requirements drop sharply to 6½ million tons in 1951. U. S. production of bituminous in 1948 ought to equal the 600 million tons turned out in 1947. If it does, Europe's need can be met. Any actual production shortage that might develop will be limited to special types of coal—particularly the better grades of coking and byproduct coal.

Steel—No material caused more trouble for U. S. industry in 1947 than steel. Western Europe—really Britain and Italy—wants steel ingots and other semifinished items (billets, blooms, etc.). These the U. S. has been consuming itself. Exports have been almost entirely in the form of finished products, like rails, bars, wire, sheets, and plates. Members of the President's Advisory Committee on Foreign Aid feel that no semifinished steel should go abroad. A likely compromise would substitute finished items for semifinished. Shipments of the latter in 1948 would be held to about 650,000 tons, less than a third of the initial request. But export of finished steel (other than sheets or tin plate) would jump to 1,150,000 tons. No straight scrap can be sent. The U. S. just doesn't have it.

Apparently, one way of solving the steel problem would be to shift U. S. exports from other areas to Western Europe.

Petroleum—Oil already is in tight supply in America, reflecting a worldwide shortage. In one sense, Europe's petroleum list is similar to that for steel. It wants to build up its crude imports and do a steadily larger amount of processing on its home grounds. Requirements are not likely to be met in full during 1948. In 1949 the situation should be easier. But it will not be surprising if refinery construction in Europe lags and more refined products are needed.



The steel dilemma.

Chemicals and Fertilizer—Nitrogen is in extremely short supply the world over, and this shortage probably will not be licked until the early Fifties. The likelihood is that Western Europe will get more nitrogen next year than this, out of a small expansion of production. The U. S. will also provide phosphates to Western Europe—perhaps 80 to 85,000 tons. Shipments of industrial chemicals, paints and pigments, coal tar products, medicinals, are likely to be considerably less than the amounts requested. Western European production can fill the most essential needs.

Coal Equipment—The total of $80 million of coal equipment which Western Europe wants in 1948 is half again as much as U. S. export to the entire world in 1947. Today, U. S. order backlogs run from 6 to 24 months on many types of mine equipment. Equipment needed quickly includes pneumatic tools, conveyor belting, and long-wall cutters. Conveyor belting is the most difficult of these. Another problem lies in the need of European mine equipment makers for machines, parts, and materials.

Petroleum Equipment—The $130 million which Western Europe may spend on U. S. petroleum equipment in 1948 comes close to total U. S. exports of that equipment in 1947. Further, the U. S. petroleum industry is undertaking a record capital outlay in production and refining of about $3 billion in 1947 and 1948. Part of this is in the Middle East and Western Europe itself. Since the American program is much further advanced, Western Europe's expansion plans may well lag.

Freight Cars—To meet the needs in Germany, 89,000 freight cars are requested in 1948-49. Freight cars are urgently needed in the U. S., but the President's Committee on Foreign Aid has recommended shipment of 20,000 cars in 1948.

Electrical Equipment—Western Europe plans to produce all the heavy apparatus required for its vast generating plant expansion—at least for the first several years. Thereafter U. S. producers probably will be in a position to help them if they need it. The 4-year need for U. S. equipment originally was set at $500 million, some $300 million to be for items that do not include any heavy apparatus. The remaining $200 million will go for hydro equipment on international projects. These possibly may be financed by the World Bank. U. S. electrical equipment producers certainly could not get such work well under way for several years. But certain shipbuilding firms might begin on turbine equipment if desired.

Large motors, turbo generators, and other items also are required for expansion in the petroleum, coal, and steel industries. Even without Europe's demand these would continue in short supply well into 1949 in the U. S.

Farm Equipment—In 1948, U. S. shipments of farm equipment to Western Europe are not likely to be more than $100 million, the scaled-down 4-year goal being about $600 million. American farmers can spare this amount of equipment although they certainly would buy it if it were not set aside for Europe. Canada and Latin America also need farm machines badly.

Heavy tractors are in record demand in the U. S., and the request of Western Europe is being cut to a fraction of what it was.

Machine Tools; Other Equipment—No direct aid is likely to be given by the U. S. for the purchase of machine tools and construction machinery. The countries concerned will use their own funds for such equipment. Shipments of machine tools to Western Europe in the first half of 1947 were at an annual rate of $75 million. They should be larger in 1948. The expansion of capacity in a number of metalworking lines will require a large variety of special-purpose tools. Machine tool needs can be met without difficulty.

Construction equipment, however, has been in great demand in the U. S., and some items such as cranes and shovels remain very tight.

What England expects to ship out.

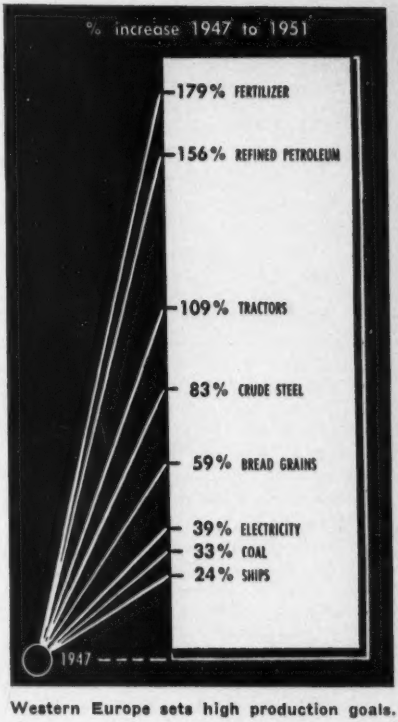
No important increases in demands for U. S. textile machinery are expected, and steam engines, canning machinery, and milling machines can be supplied without many of the difficulties reviewed above. Western Europe plans to produce most of its own automotive equipment, particularly passenger cars.

Food—The President's Committee on Foreign Aid has recommended that Europe receive about the same total foodstuffs as last year, with some shift in products. Moreover, the rest of the world will get about a million tons less. Wheat will substitute for corn, but even then the total grain supply for Europe will be down 700,000 tons or more. Half of this may be made up with a heavier shipment of fats and oils, including peanuts. Dried milk solids, dried fruits, and a wide variety of other products will close the rest of the gap. While the U. S. can send abroad whatever foodstuffs Congress agrees upon, the big question is whether this can be done without forcing prices higher.

Long-range Significance

Basic principle of the Marshall Plan is that aid alone cannot solve Europe's problem. Therefore, nothing is more critical than the goals set for an expanded capacity and production (see chart). And on a long-range basis these goals suggest lines in which Europe eventually will become independent of the United States, as well as competitive in world markets.

These goals call for a great advance from the current position. In some aspects (electricity, foodstuffs, perhaps coal, are examples) they appear unlikely to be met, at least by 1952. But a program of this size will influence world business in the longer run. New industries are to rise, old ones are to be rebuilt and expanded, exports are to be pushed—all this has a direct bearing on world markets of tomorrow. These longer-range considerations are summed up most simply in an assessment of the broad pattern



Western Europe sets high production goals.

of Europe's future trade. Here a few key trends serve as useful signposts. They are:

1 Industrially, Western Europe is preparing to make itself more independent than before the war. This will reduce its imports. After 1951, exports of American manufacturers to Europe will be concentrated largely in specialized items which the U. S. has a superior knowledge and skill to produce. Particularly will this be true with machinery.

2 Prior to the war, Western Europe was primarily an exporter of textiles, industrial products, and high-quality consumer goods. Industrial revival is along

the lines that will push these same products. However, Western Europe's program for expanding industrial capacity points to one significant modification. Capital goods exports—electrical equipment, industrial machinery, finished steel—will bulk much larger than prewar.

3 Western Europe's world trade must be considerably larger than in the late Thirties. Two developments account for this. First the split in Germany and Europe makes necessary a much larger import of essential foodstuffs and materials from outside the Continent. Second, Europe now must pay for a larger share of its imports with exchange derived from exports. In the Thirties, about one-sixth of Europe's imports represented a return on investments held abroad. While this margin is not eliminated, it has been cut substantially.

4 By far the largest items on Western Europe's import list will be foodstuffs and raw materials. These needs, to some extent, must govern the location and character of its export markets.

A survey of Western Europe's import needs in 1951 shows that Britain and Western Germany are the two countries to whom world trade will be of decisive importance. Other countries will trade as they always have.

Britain has the world's greatest food deficit. Moreover, its factories are largely engaged in converting the raw materials of other countries into finished goods. Britain has set an export goal at 175% of prewar shipments. An export volume at least 150% of prewar will be necessary for Britain to restore its earlier standard of living.

The British are concentrating on the export of the same general lines that the United States will push—machinery, automobiles, iron and steel products, and electrical goods. Britain must turn to durable goods to compensate for a smaller export of such items as coal and textiles.

Prior to the war, Britain sought to direct exports primarily to two areas—her empire and Western Europe. Except for foodstuffs from Argentina, British imports from South America were small. This situation has not changed, and there is good reason to believe Britain will seek to maintain it. Half of the postwar British exports have been allocated to the Empire, and another quarter have been shunted to Europe.

The German position is somewhat different, but not radically. Today Western Germany's population of 48 million is almost a fourth greater than in the late Thirties. Yet the region can produce little more than half the food it requires. Unlike Britain, it must start from scratch to develop export markets to pay for its food.

Coal will be one money-maker for Germany, but it won't earn exchange in all places from which Germany must buy. A likely development is the resumption of shipments of those metal products and chemicals (possibly electrical equipment) which the Ruhr can produce efficiently.

South America, with its food and raw materials, is a natural target for German trade, as it has been in the past. Another great push for German-Latin American trade is expected in the Fifties.

The Far East is a vast agricultural and raw material area, and it has great centers that lend themselves to industrial growth. If political stability were established in the Far East, the way would be open to a trade benefitting Europe, the United States, and the Far East itself. A surplus of rubber, tin, cotton, wool, fibers, and even foodstuffs might then be produced and exchanged for the industrial products of the world.

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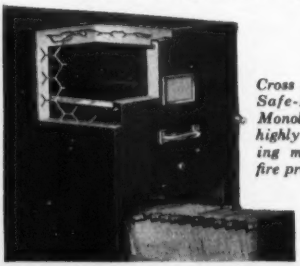

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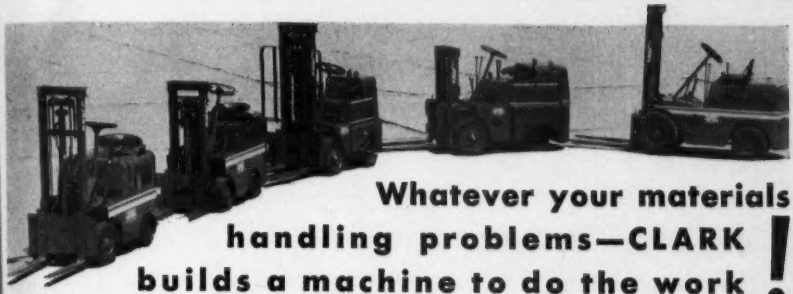

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The problem of finding ways to prolong the life of replacement parts is one of the most serious in all industry and transportation.

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If you buy castings, forgings, bearings, power shovel dippers or any among thousands of types of wear-resisting parts, a knowledge of what Brake Shoe can produce for you may well save you both time and money.

Brake Shoe specializes in producing an unlimited variety of wear-resisting parts for industry and transportation. There are both standard and special parts for railroads, power plants, sugar mills, material handling pumps, dredges, crushers and so on. Brake Shoe products embody the latest and most advanced scientific and practical knowledge of metals, methods and design.

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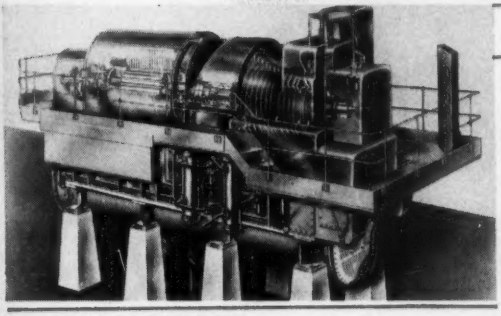
60 PLANTS SERVING INDUSTRY AND TRANSPORTATION AROUND THE WORLD

AMERICAN Brake Shoe COMPAN

WESTINGHOUSE NEWS



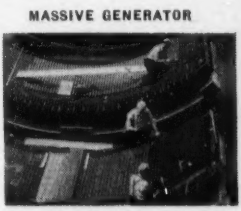
ELECTRICAL ENERGY FOR MEXICO

Long troubled by seasonal shortages of power, Mexico was quick to see an application for this newest Westinghouse development . . . the 5,000 kw steam-electric plant. Recently, for 1948 delivery, Mexico ordered six "Unit Power Plants," based on the 5,000 kw turbine-generator-condenser assembly shown here. Each unit plant, capable of serving communities of 25,000, is shipped complete. Standardization and compact Westinghouse design features keep the maintenance cost low. Similar plants are installed in or ordered for Colombia, Argentina, El Salvador, and China.

NIGHT SPORTS DRAW CROWDS

Every night grandstands fill to capacity as daytime workers flock to Westinghouse Sportslighted games. In this installation, careful engineering insures uniform shadowless light . . . top-notch playing. Eight hundred 1500-watt all-weather floodlights brilliantly illuminate plays. Spectators enjoy night coolness and lack of sun glare . . . come back often.

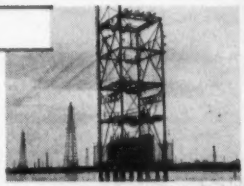
MASSIVE GENERATOR



These Westinghouse workmen are winding the huge stators used to build one of the world's largest water wheel generators. The 70,000 kva unit, one of three in use, is a key factor in an important Manchurian industrial development. This hydraulic unit supplies 3-phase, 50-cycle current at 13,800 volts.

PUMPING OIL

For the hundreds of drilling, pumping and oil collecting operations required in Venezuela's high production, electrical power is a must. This 2250 kva, 33,000 to 2300 volt, stepdown transformer is a vital link in the reliable Westinghouse distribution system used throughout.



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To obtain Westinghouse products or engineering service, contact your local distributor or Westinghouse Electric International Company, Room 1836, 40 Wall Street, New York 5, U. S. A.

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